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# Total Quality Management in an Army Truck Battalion

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TAQ, TQM, Truck Battalion, Total Quality Management, Total Army Quality 155

# TOTAL QUALITY MANAGEMENT IN AN ARMY TRUCK BATTALION

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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B.S., United States Military Academy,
West Point, New York, 1979
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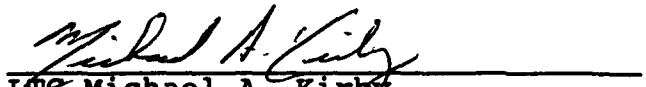
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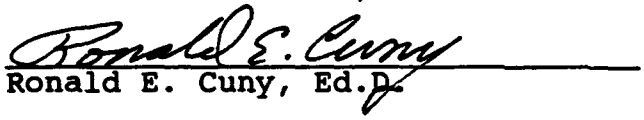
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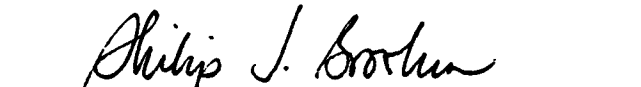
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## ABSTRACT

TOTAL QUALITY MANAGEMENT IN AN ARMY TRUCK BATTALION by MAJ Thomas G. Gargiulo, USA, 155 pages.

This study investigates the applicability of Total Quality Management (TQM) to highway operations functions in a truck battalion. Although the Army's senior leadership has embraced the use of TQM, it has been used primarily at the installation level and in acquisition and health services management functions, with little integration at the tactical level.

The study begins with a description of TQM and its benefits. The research uses case study methodology to determine the effectiveness of a Process Action Team (PAT) in solving operational problems taken from an Army truck battalion. During a simulated PAT, Command and General Staff College students role-played battalion positions and developed recommendations to improve the battalion's operations. The recommendations were then assessed for feasibility by a separate panel of officers with experience in the case battalion.

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TABLE OF CONTENTS

# CHAPTER ONE

# INTRODUCTION

The American economy has evolved substantially over its history. What began as a predominantly agricultural society survived the development into a mass-production manufacturing giant, and moved toward becoming the world's first service-based economy.[1] As our economy changed, management alsc changed to stay competitive, or was left by the wayside. This is especially true in today's market-place where competition has become increasingly diverse and intense. Increased market pressure comes not only from other American companies but from other countries as well.

Historically, management developed different tools and managerial approaches to deal with these changes and pressures. Management by objective, marketing mix, systems analysis, operations research, and organizational effectiveness have all been used by management over the years. Prior to World War I, manufacturing companies searched for better ways to mass-produce products. They were interested in making production processes more efficient than their competitors. It was this search for increased efficiency that led to fundamental changes in

manufacturing philosophies, and eventually, to the international movement toward Total Quality Management.

In his research report Total Quality Management: Good Enough for Government Work, Lieutenant Colonel Michael Prowse identified three periods in the evolution of quality in American manufacturing.[2] The first of these periods was the quality engineering period. During the 1930s and 1940s, management controlled product quality through inspections of the final products of the manufacturing process. It was during this period that engineers at the Quality Assurance Department of Bell Laboratories discovered the importance of variability in the manufacturing process. Process input variability in either raw materials, piece parts, or the assembly process itself was found to reduce quality in the final product.

During this period, engineers also developed very important statistical tools used to measure variability. Although much of this early work is attributed to Dr. Walter A. Shewhart, it is interesting to note the names of others who worked with him at Bell Laboratories; men like Joseph M. Juran and W. Edwards Deming went on to international fame in the quality management field and will be discussed later in this paper.

The second period in the quality management evolution began as engineers increased their understanding of product failure. As they learned more about how and when

individual component parts failed, it began to be possible to predict how long finished products would last between failures and how long and expensive it would be to repair them. During the 1950s, reliability engineering came into its own, partially driven by demands from the Department of Defense to correct reliability problems in military equipment produced during the procurement rush of World War II.

As products became more complex, managers coordinated the efforts of designers and planners in producing finished products that met requirements for reliability, maintainability, and availability (again, driven in part by the Department of Defense). No longer was it enough to inspect quality in the final product. Focus shifted from controlling quality in the final product to building quality into the product earlier in the production process.

During the third period the concept of total quality management became prominent. The addition of the word "total" indicated all functions of the business--from buying raw materials to customer delivery and everything in between--shared the responsibility for producing a quality product. Product quality was no longer strictly the responsibility of the quality assurance division, but that of every employee in the company.

## Total Quality Management

One of the initial problems in understanding Total Quality Management is defining the concept of quality. In the quality management field, quality means conforming to specified requirements. A high quality product or service is one that consistently meets these stated requirements. Using this definition, even cheaply made, inexpensive items exhibit high quality if they consistently conform exactly to the specified requirements for their manufacture.

Another issue surrounding Total Quality Management is understanding how improved quality benefits an organization. Simply put, improving quality cuts operating costs and increases customer satisfaction. Quality management maximizes these two characteristics and uses them to increase market share and long-term profits.

So what is Total Quality Management? It is simply a management approach that seeks to continually improve the quality of products and services in an organization. It is based on the use of scientific methods, it focuses efforts on customer satisfaction, and it depends on a supportive organizational culture.[3]

## Relevance of Total Quality Management

Total Quality Management (TQM) appears to be taking America by storm. It is the latest word in business management, and there is a plethora of books and magazine articles about it. So many companies have implemented some

aspect of TQM that, in 1986, Business Week magazine listed it as a fad of the 1980s.[4] President Bush made quality improvement a national priority in 1989 when he said:

> The improvement of quality in products and the improvement of quality in service--these are national priorities as never before. (2 Nov 89)
>
> Reasserting our leadership position will require a firm commitment to total quality management and the principle of continuous quality improvement.... Quality improvement principles apply to small companies as well as large corporations, to service industries as well as manufacturing, and to the public sector as well as private enterprise. (29 Sep 89)[5]

Although TQM is most readily applied in manufacturing companies, service industries across the country have also adapted this philosophy to their needs. It has even made inroads into the public sector. In 1988, Secretary of Defense Frank Carlucci adopted it as the Department of Defense management philosophy, and each of the military services soon followed suite.[6]

In 1992, Army Regulation 5-1 established Total Quality Management as the Army's management philosophy and named it Total Army Quality (TAQ).[7] TAQ implementation has been addressed in several Army publications since then, including Army Focus 1992, the Leadership for Total Army Quality Concept Plan, and the FY94 US Army Posture Statement.

In an effort to support the Army's TAQ goals, subordinate commanders have also promoted TAQ in their areas. The Army's former Chief of Transportation, Major

General (MG) Kenneth R. Wykle, included quality management as the Transportation Corps' first initiative in his Strategic Vision briefing. According to MG Wykle, the Corps is working to "Implement Total Army Quality (TAQ) and integrate [it] into daily missions and institutional training."[8]

In order to integrate TAQ into daily missions, it must be accepted down to the unit level. This research is an effort to bridge the gap between senior-level promotion of TAQ and actual implementation in units.

## Research Problem

The research was designed to determine the applicability of using TQM to improve an Army truck battalion's operations. The author's hypothesis was that the use of selected TQM methods would improve highway operations in a truck battalion.

The primary research question was: "Can TQM improve operations in an Army truck battalion?" In order to answer the primary research question, two secondary questions were posed. First, the research addressed whether TQM methods would work in a truck battalion. This question focused on the procedures used and their adaptability to a truck battalion environment. Second, the research addressed whether the use of TQM procedures would improve battalion operations or not. This question focused on the results of the TQM procedures used.

## Limitations

The focus of this study was an active Army truck battalion. Since truck battalions are large and diverse organizations, the focus was further narrowed to the area of operations within the battalion. This purposely excluded the administrative, maintenance, and field training functions except as they impact on truck operations. Operations was selected as a focus for the research since the author and the other major players in the research methodology shared a background in truck operations.

Another limitation of this study pertained to its focus on selected aspects of TQM. A complete evaluation of TQM was certainly beyond the scope of this study. As a result, the research addressed only certain tools used in a TQM approach. Since the research was conducted primarily through the observation of simulated Process Action Team activities, the TQM procedures evaluated were limited to those found in the conduct of a Process Action Team.

As a further limitation, the research only evaluated the initial steps of the TQM procedures used. Whereas a TQM approach normally works in a continual cycle of improvement plan development, testing, revision, implementation, and then development again, the research was limited to the initial improvement plan development. Only the initial effects of using TQM could be observed without a longitudinal study evaluating a battalion over time.

## General Assumptions

In addition to the limitations explained above, there were several general assumptions made in the research. Probably the most critical assumption was in the area of answering the "how" in the research question. The research assumed that a successful demonstration of TQM improvement in a sample case study would be sufficient to illustrate how TQM could improve operations in a truck battalion. In other words, a successful case study of TQM in action would provide the answer to how TQM could work in a truck battalion.

Another assumption concerned the representativeness of the subject of the research, the operations of a truck battalion. It was assumed if a TQM approach was shown to improve operations in a sample truck battalion, then a similar approach would also work in other truck battalions. Additionally, it was assumed if a TQM approach could improve one function in a battalion, then it could also work in other functional areas of a battalion. This assumption was based on the fact that it was the TQM processes that were evaluated in the study. The research assumed that these processes could be applied to other functions (such as maintenance, administration, and field training) of the same battalion, and in other battalions. In other words, if a TQM approach was shown to improve operations, it could also

improve maintenance; if it improved this battalion, it could also improve other battalions.

A third assumption dealt with the limitation noted above concerning the use of selected aspects of TQM. In order to reduce the scope of the paper, it was assumed that the successful application of selected aspects of TQM would suffice to answer the research question. The use of Process Action Team procedures to illustrate other TQM procedures was assumed representative enough for the purposes of the study.

A final assumption addressed time constraints on the research. The paper assumed even though the research would evaluate only the initial steps in a TQM approach, further application of TQM methods would have similar results. In other words, if the initial results were successful, further application would produce further improvement.

## Summary

There appeared to be a demonstrated need for research into the application of Total Quality Management in the Army. To support stated Army goals of integrating TQM into daily missions and training, particularly in the Transportation Corps, it must have applications down to the unit level. This paper was an attempt to link senior-level guidance to unit-level execution. It was designed to determine whether TQM procedures would work in a battalion.

The paper was focused on a narrow scope to keep within the limitations of the thesis program. It addressed selected methods used in a TQM approach, namely the Process Action Team. It also limited the subject to a specific function in a truck battalion, that of truck operations. Although limited in scope, the research was designed to facilitate expansion to incorporate other TQM methods and to apply them to other units and other functional areas. Expanding the scope of the research to include these, however, was left to future researchers.

The assumptions made in the previous paragraphs support the thesis in general. Steps were taken in the design of the research to minimize the threat these assumptions made on the validity of the thesis. These steps are explained in Chapter Three.

## Endnotes

[1]Shirley A. Hopkins, Sandra Strasser, Willie E. Hopkins, and Jerry R. Foster, "Service Quality Gaps in the Transportation Industry: an Empirical Investigation," Journal of Business Logistics 14, no. 1 (1993): 145.

[2]Michael J. Prowse, Total Quality Management: Good Enough for Government Work, (Maxwell AFB, Alabama: Air University Press, October 1992), the section on evolution of quality management is taken from pages 2-14.

[3]Marshall Sashkin and Kenneth J. Kiser, Putting Total Quality Management to Work (San Fransisco: Berrett-Koehler, 1993), 3, 27-39.

[4]"Business Fads: What's In--And Out," Business Week, 20 January 1986, 60, quoted in Sashkin and Kiser, 6.

[5]George Bush, speeches quoted in "How to Get Started: Implementing Total Quality Management," Federal Total Quality Management Handbook (U.S. Department of Commerce, June 1990), 1: preface.

[6]Memo, Frank Carlucci to Secretaries of the Military Departments, "Department of Defense Posture on Quality," 30 March 1988, DOD TQM Working Group Papers.

[7]U.S. Army, FM 5-1, Army Management Philosophy (Washington: Department of the Army, 1992), 3.

[8]Kenneth R. Wykle, "Transportation Corps Strategic Vision," Briefing to U.S. Command and General Staff College Transportation Corps Officers, August 1993.

# CHAPTER TWO

## LITERATURE REVIEW

There has been a considerable amount of writing about Total Quality Management in the last decade. Some of the more prominent names in the literature are Shewhart, Deming, Juran, Crosby, Feigenbaum, and Ishikawa. Although each of these quality experts approach TQM in slightly different ways, their views are more similar than not. In addition to the books discussing their theories, there are many other books available that translate the theoretical work of the masters into easy-to-apply instructions for modern managers looking to improve the profitability of their organizations. There are even more recent periodical articles that portray TQM success stories in different companies and in different industries.

The military has taken part in the TQM movement and it too has developed a TQM library of plans, regulations and instructional material. As in industry, there are some who believe the approach will work and have begun application in their areas of control, and there are others who have not.

## The Quality Gurus

Some of the earliest work on quality improvement is derived from Walter A. Shewhart's statistical studies on variability in manufacturing in the 1920s and 1930s. Shewhart recognized the importance of variability in manufacturing and its impact on product quality. He was the first to suggest ways to improve the product and production process. Shewhart worked with two men who later became widely connected with the total quality management movement: W. Edwards Deming and Joseph M. Juran.[1]

Prior to World War II, Dr. W. Edwards Deming was very active in promoting his concept of management philosophy--Total Quality Management. Dr. Deming lectured many American companies in the 1930s and 1940s, when there was wide-spread interest in quality control. During the war, Deming assisted the federal government in the area of industrial production for the war effort.[2]

Deming is best known, however, for his impact on Japanese industry after World War II. He assisted the Japanese in rebuilding after the war, initially as a U.S. Census Bureau consultant and later as a management advisor. He gave many lectures and assisted the Japan Union of Scientists and Engineers (JUSE) in improving the quality of Japanese industrial products. Current Japanese industrial success has been credited in large part to Deming's teachings.[3]

Dr. Deming's Out of the Crisis (1986), and two books about his teachings, The Deming Management Method (1986), by Mary Walton, and Dr. Deming: the American Who Taught the Japanese About Quality (1990), by Rafael Aguayo, all expound on the Deming vision of TQM. Deming's teachings changed somewhat since before World War II. He initially stressed dependence on statistical analysis to decrease variability in manufacturing processes. After his return to America from post-war Japan his focus moved away from statistical techniques and more towards the human element and management support. The shift in focus was due in part to the failure of his pre-war teachings in America to last through the war. He realized long-term changes in American industry would only work if management supported them.[4]

Deming's written work can be confusing because of his writing style and because of his shift in focus over the years. Additionally, Deming modified his Total Quality Management model as required. Where initially he taught about nine management principles, his more recent work lists 14 principles. A short description of his principles from Out of the Crisis follows:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.

2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

6. Institute training on the job.

7. Institute leadership (see Point 12...). The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.

8. Drive out fear, so that everyone may work effectively for the company....

9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.

11a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.

b. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

12a. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must change from sheer numbers to quality.

b. Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective....

13. Institute a vigorous program of education and self-improvement.

14. Put everybody in the company to work to accomplish the [TQM] transformation. The transformation is everybody's job.[5]

Deming believes that his principles apply not only to manufacturing but also to the service sector and non-profit industries, including government. He insists that his "14 points apply anywhere, to small organizations as well as to large ones, to the service industry as well as to manufacturing. They [even] apply to a division within a company."[6] In Out of the Crisis, Deming portrays several examples of quality improvement in the area of the transportation industry.

Teamwork is vital to Deming's vision of total quality management. He includes lack of teamwork as one of the major obstacles to quality improvement in American companies, and identifies Japanese quality circles as an effective way to maximize the benefits of teamwork.[7] In Out of the Crisis, he describes an organizational structure for quality improvement which includes teams made up of workers and managers from within several departments company-wide.[8]

A contemporary of Deming, Dr. Joseph M. Juran is another of the quality improvement experts. His ideas, as put forth in Quality Control Handbook (1974), and On Planning for Quality (1988), agree fundamentally with those of Deming. Juran also taught in Japan after World War II. He espouses the 80/20 rule: 80% of the processes in

industry are controlled by management--workers control only 20%.[9] As a result he, too, stresses upper management involvement in quality improvement. His work also stresses quality improvement through the continuous improvement of processes on a project-by-project basis.[10]

Juran uses the term "fitness for use" to define quality--"...the extent to which the product successfully serves the purposes of the user, during usage, is called its fitness for use."[11] Juran also is one of the first to develop the idea of cost of quality. Based on this concept, organizations can identify a real cost savings to accompany quality improvement. He proposes that corporate divisions can and should use this cost savings to justify increased expenditures on quality improvement.[12]

Juran's Trilogy encompasses Quality Planning, Quality Control, and Quality Management (also called Quality Improvement). In his book, Quality Control Handbook, Juran lists steps to be taken when improving quality. They are paraphrased as follows:

1. Proving the need for a project improvement program. Juran believes that the first step is to justify to management the expenditure of resources to correct a perceived quality problem. This is one of the areas where his concept of the cost of quality is useful, i.e. when the resources being wasted on poor quality production is greater than the cost of correcting the problem.

2. Identifying the projects. Juran advocates the use of a Pareto analysis to determine which projects will make the greatest improvement with the least effort. This allows prioritization of project improvement efforts.

3. Securing management approval. Management must be convinced that resources should be allocated to the project being proposed over other projects. Management support is critical to the quality improvement process, yet may be difficult to attain.

4. Organizing for improvement. Juran describes two roles for people in successful projects, the steering committee and the diagnostic team. Each plays a critical part in quality improvement, with the former identifying probable problem sources and developing possible solutions, and the latter conducting detailed analyses to discover causes of defects.

5. Diagnosis to discover causes and remedies. Juran spends nine chapters on tools and methods for diagnosis, which range from simple to highly technical. He states that the first step in diagnosis is to properly understand the symptoms of the problem, including developing an accurate understanding of cause and effect in the problem area. Testing and statistical process control methods are used in developing this understanding.

6. Making remedies effective. Once diagnosis has established the cause and effect relationships in a process(es), the project under way enters what Juran calls the remedy sequence. During this step the steering committee selects which remedy to institute and develops control measures to monitor the process to ensure the quality improvements remain in effect.[13]

Juran's steps are designed for both manufacturing and service industry processes. In the Quality Control Handbook, he devotes an entire chapter to the application of quality improvement to service industries. He specifically lists both transportation and government (including defense) under service industries and includes several short case studies in the transportation field (i.e., North American Van Lines, U.S. Postal Service, and United Parcel Service).[14]

One difference he notes between manufacturing and service industries is that timeliness is often more important to customers in the service industry arena.[15] Another difference is that service-based companies often have much more direct contact with customers than do manufacturing companies. The benefit of this is that service company employees have more frequent opportunities for feedback on customer satisfaction.[16]

Juran also notes that service industries are less likely to have fully developed quality improvement organizations than are manufacturing companies. Fundamentally, he believes that although quality improvement is equally applicable to service companies, the concept has not been fully accepted across the industry.[17]

Dr. Philip B. Crosby, author of Quality is Free (1979) and The Externally Successful Organization (1988), is best known for the zero defects concept in the 1960s. He, too, stresses that quality is management's responsibility and that in purchased items at least one-half of all quality problems are caused because management has not clearly stated requirements. Crosby also believes that suppliers should be included in the quality improvement process to help prevent quality defects earlier in the production process.[18]

Crosby differs somewhat from other quality experts in that he thinks we should not accept any errors or defects

(hence the term zero defects) in the production process. He also differs somewhat in his definition of quality in that he uses the term "conformance to requirements."[19] The difference is slight, however, when the requirements are set in accordance with customer needs. Crosby identifies 14 steps to quality improvement, as listed below:

1. Make it clear that management is committed to quality.

2. Form quality improvement teams with representatives from each department.

3. Determine how to measure where current and potential quality problems lie.

4. Evaluate the cost of quality and explain its use as a management tool.

5. Raise the quality awareness and personal concern of all employees.

6. Take formal actions to correct problems identified through previous steps.

7. Establish a committee for the zero defects program.

8. Train all employees to actively carry out their part of the quality improvement program.

9. Hold a "zero defects day" to let all employees realize that there has been a change.

10. Encourage individuals to establish improvement goals for themselves and their groups.

11. Encourage employees to communicate to management the obstacles they face in attaining their improvement goals.

12. Recognize and appreciate those who participate.

13. Establish quality councils to communicate on a regular basis.

14. Do it all over again to emphasize that the quality improvement program never ends.[20]

As do Deming and Juran, Crosby notes that quality management pertains not only to manufacturing industries but to service industries as well.[21] Crosby is also an advocate of team activities in quality improvement. In his second step to quality improvement Crosby specifically mentions creating improvement teams with representatives from each department in the company.[22]

The last of the most commonly known American quality experts is Dr. Armand V. Feigenbaum, the author of Total Quality Control (1983). As indicated by the book title, his focus is on management's requirement to control quality. Feigenbaum's thoughts may be summarized in the following 19 steps to quality improvement.

1. Total quality control defined. TQC may be defined as: An effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organization so as to enable marketing, engineering, production, and service at the most economical levels which allow for full customer satisfaction.

2. Quality versus quality. "Big Q" or Quality refers to luxurious quality whereas "little q" refers to high quality, not necessarily luxury. Regardless of an organization's niche, little q must be closely maintained and improved.

3. Control. In the phrase "quality control," the word control represents a management tool with four steps:
    1. Setting quality standards.
    2. Appraising conformance to these standards.
    3. Acting when the standards are exceeded.
    4. Planning for improvements in the standard.

4. Integration. Quality control requires the integration of often un-coordinated activities into a framework. This framework should place the responsibility for customer-driven quality efforts across all activities of the enterprise.

5. Quality increases profits. Total quality control programs are highly effective because of their results in improved levels of customer satisfaction, reduced operating losses and field service costs, and improved utilization of resources. Without quality, customers will not return. Without return customers, no business will long survive.

6. Quality is expected, not desired. Quality begets quality. As one supplier becomes quality oriented, other suppliers must meet or exceed this new standard.

7. Humans impact quality. The greatest quality improvements are likely to come from humans improving the process, not [from] adding machines [to the process].

8. TQC applies to all products and services. No person or department is exempted from supplying quality services and products to its customer.

9. Quality is a total life-cycle consideration. Quality control enters into all phases of the industrial production process, starting with the customer's specification, through design engineering and assembly to shipment of the product and installation, including field service for a customer who remains satisfied with the product.

10. Controlling the process. These controls fall into four natural classifications: new design control, incoming material control, product control, and special process studies.

11. A total quality system may be defined as: The agreed company-wide...operating work structure, documented...for guiding the coordinated actions of the...company...to assure customer quality satisfaction and economical costs of quality. The quality system provides integrated and continuous control to all key activities, making it truly organizationwide in scope.

12. Benefits. Benefits often resulting from total quality programs are improvement in product quality and design, reduction in operating costs and losses, improvement in employee morale, and reduction of production-line bottlenecks.

13. Cost of quality. Quality costs are a means for measuring and optimizing total quality control activities. Operating quality costs are divided into four different classifications: prevention costs,

appraisal costs, internal failure costs, and external failure costs....

14. Organize for quality control. It is necessary to demonstrate that quality is everybody's job. Every organizational component has a quality-related responsibility; for example, marketing for determining customers' quality preferences, engineering for specifying product quality specifications, and shop supervision for building quality into the product. Make this responsibility explicit and visible.

15. Quality facilitators, not quality cops. The quality control organization acts as a touchstone for communicating new results in the company, providing new techniques, acting as a facilitator, and in general resembles an internal consultant, rather than a police force of quality inspectors.

16. Continuous commitment. Management must recognize at the outset of its total quality control program that this program is not a temporary quality improvement or quality cost reduction project.

17. Use statistical tools. Statistics are used in an overall quality control program whenever and wherever they may be useful, but statistics are only one part of the total quality control pattern. They are not the pattern itself....

18. Automation is not a panacea. Automation is complex and can become an implementation nightmare. Be sure the best human-oriented activities are implemented before being convinced that automation is the answer.

19. Control quality at the source. The creator of the product or the deliverer of the service must be able to control the quality of their product or service. Delegate authority, if necessary....[23]

Feigenbaum believes quality control is applicable to all functions in all industries, including service industries.[24] He also supports employee involvement in quality improvement through team efforts. In Total Quality Control, he discusses the benefits of quality circles among other team approaches.[25]

One of the Japanese quality experts, Kaoru Ishikawa, also deserves mention here. His work can be distinguished from the other experts primarily because of his focus on involving the worker in quality control. He advocates putting quality control tools in the hands of workers to increase their involvement in the quality improvement process. He promotes seven tools useful in quality control work.

1. Pareto charts. Pareto analyses help identify primary causes of quality control problems, and help prioritize improvement efforts effectively.

2. Cause and effects diagrams. These are graphical representations of the causes and effects for a problem under study. They are useful in brainstorming sessions.

3. Histograms. These are charts that group together statistics to help identify patterns for problem solving.

4. Check sheets. These are a simple means of recording data on a process, for later analysis.

5. Scatter diagrams. These are charts that assist in determining correlations among data, which is useful in identifying cause and effect relationships.

6. Flowcharts. Flowcharts graphically depict the sequence of events in a process. They assist in locating systemic problems in quality control.

7. Control charts. These are statistical tools that provide a graphical means of determining if a process is performing within standards.[26]

Ishikawa is famous for the development of the quality circle concept, an organized framework for team problem solving. Quality circles are small groups of employees that meet regularly to identify quality control problems impacting on their own work processes, and to

generate possible quality improvement solutions to these problems.[27]

Ishikawa believes that quality circles are more important in service industries than in manufacturing because service employees tend to work closer with customers.[28] Some of the basic tenets of Ishikawa's philosophy follow.

1. Quality begins with education and ends with education.

2. The first step in quality is to know the requirements of customers.

3. The ideal state of quality control is when inspection is no longer necessary.

4. Remove the root cause, and not the symptoms.

5. Quality control is the responsibility of all workers and all divisions.

6. Do not confuse the means with the objectives.

7. Put quality first and set your sights on long-term profits.

8. Marketing is the entrance and exit of quality.

9. Top management must not show anger when facts are presented by subordinates.

10. Ninety-five percent of the problems in a company can be solved by the seven tools of quality control.

11. Data without dispersion information is false data--for example, stating an average without supplying the standard deviation.[29]

Although each of the well-known quality experts espouse their own version of TQM, the similarities outweigh the differences. Each of them begins his arguments with a definition of quality based on what the customer wants.

This customer-driven approach is applied by every one of the experts and is used in the micro- (customers internal to the organization) and macro-perspective (external customers). Additionally, each expert argues that management should base decisions on hard data instead of hunches. Some of them stress a dependence on statistical tools more than others (Deming, Juran, Feigenbaum, and Ishikawa more than Crosby), but all agree that intelligent decisions depend on accurate information.

Each expert lays the responsibility for quality improvement squarely on the shoulders of management. All argue that in order to develop a truly high-quality organization, the management culture must support it. All stress a long-term organizational commitment, a continuous improvement philosophy, and a belief in teams and teamwork in solving problems.

The experts all write that problems should be attacked at the source, or as far "up-stream" as possible in each process. Determining the root cause for quality problems and reducing dependence on final inspections is a common theme in each of their approaches to quality improvement. Finally, each specifically notes TQM applies to all organizations, functions, and industries.

## Other Sources

In addition to the major contributions by the well-known quality experts, there are numerous books published by

educators, business executives, and consultants which explain how to apply the theories of the established experts. An example is Putting Total Quality Management to Work (1993), by Marshall Sashkin and Kenneth J. Kiser, which describes TQM in layman's terms and tells managers how to use it.[30] Other books focus on a particular aspect of TQM and expound on it in great detail. An example is The Team Handbook, by Peter R. Scholtes, which offers detailed instructions for quality improvement teams.[31]

There are also numerous periodical articles about Total Quality Management published throughout the last decade. One 1993 article in Public Productivity and Management Review discusses the difficulties in applying the principles of TQM in state and local government organizations, particularly with regard to the organizational culture in those organizations.[32] The article addresses implementing Total Quality Management amid current forms of organizational program evaluation, performance measurement, and performance appraisal. Of the three, author Mark Glaser concludes that TQM is most compatible with program evaluation, since both approaches use factual data, feedback, and the scientific decision-making process. He argues that TQM is not only compatible with typical governmental program evaluation, but may augment the effectiveness of program evaluation efforts.

Glaser feels that current departmental performance measurement within government may be less compatible with a TQM approach than program evaluation. One of the primary reasons is that government lags behind industry in determining costs associated with work processes. He notes, however, that this barrier to successful TQM implementation can be overcome through strong leadership that remains focused on high-quality service to the customer. In fact, one of the primary benefits of a TQM approach would be to identify and reduce waste in work processes, resulting in improved service at a lower cost.

According to the article, the least compatibility is in the area of individual performance appraisal. Glaser identifies one of the cultural difficulties many American organizations have with implementing TQM: the concept of individual accountability. Although he feels performance appraisal represents the most challenging threat to Total Quality Management implementation, he notes that in the short run, increased employee involvement may help to reduce the incompatibility.

In another 1993 article from National Productivity Review, author David Graves urges companies to disregard what he terms the myth that top management must instigate quality improvement. He notes that most meaningful changes occur as a result of someone on the fringe of an organization who has a vision and is persistent in pursuing

it.[33] This individual must convince management of the potential advantages to be recognized with the change. This concept may be relevant in large bureaucracies like the U.S. Army in that lower level leaders can implement a TQM approach prior to commitment from senior leaders.

Distribution magazine publishes a "Quality Profiles" section that discusses case studies of successful quality improvement programs among companies in the distribution industry. The magazine outlines improvements in scores of companies such as Yellow Freight System, which saved thousands of dollars in 1989 in administrative costs by incorporating employee recommendations.[34] Chemical Leaman, a nationwide tank carrier, claims their quality improvement efforts have been successful because of the action teams appointed to prescribe company policies and procedures. These action teams comprise managers and terminal employees, and "tap the collective wisdom of many people."[35] Several other transportation companies, including Spartan Express, Mark VII Transportation, Sea-Land Service, and Alliance Shippers all claim that quality improvement efforts continue to help in improving customer service and reduce shipping costs.[36] Federal Express was so successful in its TQM implementation that in 1990 it was the first service company to win the Malcolm Baldrige National Quality Award.[37]

## TQM in the Military

In addition to the books and periodicals discussing TQM, there are several Department of Defense and Department of the Army documents addressing TQM. Few high-level publications, particularly with audiences on the acquisition side of the military, do not address quality in some manner. What is missing, though, seems to be the link between guidance from the Army's senior leadership to implement TQM and action from lower level management.

In 1988, Secretary of Defense Frank C. Carlucci announced that the Department of Defense (DOD) would implement TQM with an ultimate goal of "satisfied, quality-equipped, quality-supported" soldiers, sailors, airman, and Marines. He recognized that weapons systems acquisition is central to the DOD mission, and as a result, directed the Under Secretary of Defense for Acquisition to lead the DOD effort.[38] That same year in an internal Department of the Army memorandum, Under Secretary of the Army Michael Stone wrote "the TQM principles apply equally to the Army's financial, engineering, medical, personnel and logistics communities as well."[39] In the memorandum he asked senior Army leaders "to incorporate [TQM principles] in your everyday business and as part of all Army programs."[40]

In 1992, Army Regulation 5-1 established Total Quality Management as the Army's management philosophy. The

regulation renames it Total Army Quality (TAQ) and defines it as:

> A leadership philosophy and management approach. It is a leadership philosophy which empowers all individuals to build on the aggregate capabilities of our quality Army. As a management approach, Total Army Quality focuses on continuous process improvement to meet or exceed the expectations of internal and external Army customers.[41]

The regulation assigns the responsibility of implementing TAQ to leaders, commanders, and managers at all levels, and lists nine actions they will use to meet that responsibility.

1. Providing a clear vision.

2. Employing an organized, systematic approach toward continuous process improvement.

3. Ensuring efficient stewardship of and accountability for resources.

4. Providing people with authority commensurate with their responsibilities.

5. Actively developing people.

6. Developing a climate which encourages and rewards openness, initiative, and change in the pursuit of quality.

7. Listening and using their people's ideas and suggestions for job and process improvement, mission redefinition--and taking appropriate action.

8. Providing people with the maximum responsibility appropriate to their capabilities.

9. Establishing long term relationships with quality suppliers.[42]

Finally, the regulation lists eight precepts upon which the Army management philosophy is based. These precepts include top management leadership, satisfying

customer requirements, training, empowerment, teamwork, measurement and analysis, and continuous process improvement.[43]

Two other Army publications, Army Focus 1992: The Army in Transformation and the United States Army Posture Statement FY94: Change and Continuity both address TAQ implementation. Although Army Focus states TAQ is a vital element of the Army's transformation process, the discussion is limited to the installation management section of the publication.[44]

The Army Posture Statement also seems to limit TAQ implementation goals to what it calls the "industrial and managerial side" of the Army. It mentions examples of TAQ success in helicopter acquisition programs, recruiting efforts, health services efforts, and the Army Communities of Excellence program.[45] While it never specifically addresses TAQ implementation in operational units, it does state that "every major command is actively studying TAQ applications, training its people, and beginning implementation."[46] It further states that Training and Doctrine Command has begun integrating TAQ into common leader training programs.[47]

The most comprehensive Army publication is the Leadership for Total Army Quality Concept Plan which builds on Army Regulation 5-1 and addresses Army-wide implementation of TAQ. The Concept Plan offers more

specific guidance than do the other Army publications. It stresses the need for a team-based infrastructure comprising the three levels of top management, middle management, and workers.[18] Normally these levels result in three corresponding teams. The Executive Steering Committee provides strategic direction and quality improvement goals for the organization and the other teams. The Quality Management Board(s) is a cross-functional team that selects specific processes for study (based on potential improvement), monitors those processes, and charters Process Action Teams for specific projects. Project Action Teams (PATs) use statistical and problem-solving tools to identify causes and solutions to quality problems. PATs normally include workers who are involved in the process under study and customers and suppliers who deal with the process on a regular basis.

The Concept Plan states that the intent of TAQ implementation is to improve quality and increase productivity. This intent is in keeping with the TQM theories proposed by the quality experts, and is also within the parameters espoused by other DOD and Department of the Army documents. What is most interesting, though, is that the Concept Plan attempts the next step and addresses the operational use of TQM. Not only does the plan state successful implementation of TAQ will result in continuously improved training, unit readiness, and combat effectiveness,

but it explicitly states TAQ is "being incorporated into all of the Army's professional development courses and will be applied in operational assignments."[49] This is the only document the author found that specifically addresses operational assignments and what matters most to tactical commanders--training, readiness and combat effectiveness.

There is evidence that the Army is including TQM training in its professional development courses. The 1993 Command and General Staff College (CGSC) curriculum includes a two-hour lesson on Total Army Quality in its core course, "Fundamentals of Senior-Level Leadership in Peace and War." The college also offers an elective course that explores TQM philosophy and its application to the U.S. Army. The reading assignment for the core course is an interesting indicator of Army acceptance of TQM at the tactical level. The first article, "Adapting Total Quality Management (TQM) to Government" by James E. Swiss, addresses the applicability of TQM in government.[50] Swiss argues that TQM, with modifications, can make a useful contribution to public management. His modified TQM would still focus on customer satisfaction, even though identification of government customers can be difficult. It would also make strong use of the quantitative tools advocated in TQM, and the concept of continuous improvement. Finally, Swiss argues that worker participation, or empowerment of employees, is a valuable step in the right direction.

The second article addresses the difficulty in implementing a TQM approach in an organization. In it, author Richard Y. Chang notes that many organizations focus on the implementation activities themselves, rather than the results hoped for.[51] The third article describes how the author successfully implemented TQM in his business.[52]

Of the six articles in the course reading assignment, only three deal explicitly with implementing TQM in tactical military units. All three are taken from the Marine Corps Gazette and discuss the U.S. Marine Corps version of TQM known as Total Quality Leadership (TQL). Colonel John J. Sullivan introduces the Marine reader to TQL in his article. In it he notes that "continuous quality improvement is not only appropriate to the acquisition, development, and manufacturing process, but also to warfighting organizations."[53] He also discusses the importance of multi-functional Process Action Teams (PATs) in developing improvements, and offers a possible example of their use in a tactical unit in developing training.

The second Marine article, written by Captain James F. Brownlowe, argues that "when applied by the small unit leader, [TQM] is nothing more than fundamental leadership principles."[54] The last article argues that TQL is not just "smoke and mirrors," but an important tool for the Marine Corps.[55]

The institutional TAQ training being conducted at the Army's Command and General Staff College attempts to address implementation at the tactical level, but does so only superficially. In fact, all of its tactically oriented readings are from United States Marine Corps articles/examples. While official Army documents indicate full support of TAQ implementation, only some directly address implementation at operational and tactical levels. Most of the current Army effort seems to be in the areas of acquisition, health services, and installation management.

The author conducted telephonic interviews with several Army officials in an attempt to find examples of TAQ implementation in tactical units. The first interview was with Major Ehlinger from the Management Practices Branch of the office of the Chief of Staff of the Army. During the interview he noted that TAQ implementation has been most successful at the installation level, but that Major Army Commands (MACOMs), such as the Army Materiel Command, have begun to use TAQ to promote cost reduction measures.[56] He had no direct knowledge of TAQ use in tactical units, but thought that the TAQ office at Forces Command (FORSCOM) would.

The Chief of the Quality Leadership Office at FORSCOM, Linda Rocha, was very positive about FORSCOM's implementation program. She indicated TAQ was first investigated under General Burba in 1991, but implementation

really began in earnest in April, 1993 when General Reimer assumed command of FORSCOM. She agreed that most of the to date has been at the installation level, but pointed out that the FORSCOM goal is to implement TAQ down to the tactical level. She said General Reimer will not require actions at lower levels until TAQ has shown some success at the FORSCOM headquarters. The headquarters has a permament TAQ infrastructure with a command level (including corps commanders) Executive Steering Committee and a Quality Management Board in each directorate. To date there have been only two Process Action Teams, both at the headquarters.[57] Ms. Rocha provided several other sources of possible tactical level implementation, as discussed below.

While she indicated the Headquarters Company of 24th Infantry Division (Mechanized) had used TAQ to improve its supply room procedures, the company commandant could not confirm that it had been used at all.[58] However, according to James Halford, the 101st Infantry Division (Air Assault) TAQ Officer, that division has an established Executive Steering Committee and two Quality Management Boards, one for the division (chaired by the chief of staff) and one for the installation. Mr. Halford indicated two primary TAQ actions ongoing: on the installation side the 101st DIVARTY was conducting focus groups to improve quality of life for soldiers, and on the division side the headquarters was redesigning its METL based on a new commander's vision

statement. He said there have been no efforts directed at improving processes yet, but he felt that would be the next step.[59]

The most impressive example of TAQ implementation Ms. Rocha was able to uncover was in the 7th Infantry Division (Light). According to Robert Milner, Chief of Plans and Operations for the Fort Ord Directorate of Logistics, before the division was deactivated the Assistant Division Commander for Support was very supportive of TAQ and worked with the nearby Travis Air Force Base commanding officer to improve the division's ability to rapidly deploy. Mr. Milner said Travis Air Force Base officers initiated a Process Action Team (with members of the division) to improve the processes for rapid deployment of the division. Based on the team's recommendations, the estimated savings were 50,000-60,000 man-hours per year.[60]

In order to determine the level of TAQ implementation in Army transportation units, the author interviewed Pat Hogge, the TAQ administrator in the Department of Resource Management at Fort Eustis. She indicated that Fort Eustis has a TAQ infrastructure, with an Executive Steering Committee chaired by the Commanding General, and has activated Process Action Teams. The focus, however, has been at the installation level, with work done in the Department of Engineering and Housing, the Department of Resource Management, and the post hospital. Although she

knew of no improvement efforts dealing directly with the transportation units at Fort Eustis, she said the Executive Steering Committee was considering investigating improving the training of reservists.[61]

As indicated earlier in this chapter, the quality experts argue that TQM is applicable in all organizations. Articles in periodicals specifically address its implementation in government. The Departments of Defense and the Army have accepted TQM as their management philosophies. At the strategic level the Army supports the TQM approach, but, as the above interviews seem to indicate, very limited success has been enjoyed to date in implementing TAQ at the lowest, tactical levels. As mentioned in the first chapter of this paper, one of the goals of the Army Transportation Corps is to "...integrate [TQM] into daily missions...." While the purpose of this thesis is to explore the tactical use of TQM and determine its applicability at that level, the first step is to develop an understanding of the TQM approach.

## The TQM Approach

TQM is essentially a synthesis of several other aspects of managerial science. It combines aspects of marketing, operations research, participatory leadership, and product line management. It focuses on long-term success through continuous improvement of products and services and the processes that produce them.

The TQM approach derives its strong customer orientation from marketing philosophy. Both require that organizations identify customers and customer needs and expectations in order to satisfy them. In a marketing approach, the focus is on the customer.[62] TQM formalizes the concept of satisfying internal as well as external customers in an organization.

TQM has a strong basis in statistical methods, derived from the operations research field. As noted in the evolution of quality in Chapter One, early work in quality control concerned variability in processes and its effect on final products. There are many statistical tools available to the expert for analysis of data for decision-making. TQM has adopted many of them to the extent that some authors call them TQM tools.[63]

The movement away from the directive leadership style towards a more participative style is important to TQM. Normally, the people with the most knowledge about a process are the people who actually work daily on the process--not senior managers.[64] Therefore, under TQM, workers--as well as managers--should participate in planning for and improving the process. To this end TQM encourages the formation of multi-functional teams to improve processes.[65] A second facet of participative leadership style is to foster teamwork among the divisions in an

organization to improve cooperation and coordination within the organization.[66]

Product line management structures an organization by product line, across functional area lines. It reduces the impact of bureaucratic "turf battles" by giving longitudinal responsibility for a product to the people who work on the product. TQM adopts the concept when it takes the responsibility for product quality from the quality control office and returns it to the managers and workers who own and run the processes. This approach helps break down barriers between staff areas, as encouraged by Deming in his 14 points.

## What TQM Does

There are three very important ideas that must be understood in order to discuss the TQM approach: the concept of quality, how improving quality can help an organization, and how TQM can help an organization improve quality.

The quality experts define quality in terms of satisfying customer requirements. Juran uses the phrase "fitness for use," where the customer is the user.[67] Deming defines quality as the "economic manufacture of product that meets the demands of the market."[68] Feigenbaum is even more direct when he observes that "Quality is what the customer says it is."[69] As mentioned earlier, even Crosby's use of the term "conforming to specified requirements" results in

the same definition when the customer orientation allows customers to generate those requirements.

A high quality product or service, then, is one that consistently satisfies the customer's requirements. Feigenbaum identifies a difference between luxury and quality in his second step to quality improvement. Thus, even the most inexpensive item can be a high quality product if it consistently satisfies the customer.

There are two very good reasons an organization should want to improve quality. Improving quality increases both efficiency and effectiveness in an organization, resulting in reduced operating costs, greater customer satisfaction, and increased market share.

Efficiency is a measure of production compared to resources consumed in the process.[70] It is a measure of the cost effectiveness of a process. Any process consumes resources, whether they are money, man-hours or materiel. A process that fails to consistently produce output that meets requirements generates increased resource consumption, primarily as a result of having to correct the faulty product. This concept is best captured by Crosby's term the "cost of quality."[71] A manufacturing example would include all the inspection costs, recall costs, and rework (or scrap) costs associated with sub-standard products. An example in a military trucking company would include the waste associated in mis-delivering cargo: the man-hours

wasted in correcting the problem, and the impact on the customer who does not receive the expected shipment.

Based on the TQM definition of quality, as an organization improves quality its products and services more and more consistently meet requirements. As the frequency of defects decreases, so do the associated costs. Crosby notes many organizations have found the costs associated with quality improvement are far out-weighed by the resulting savings.[72] One of the overall results of a successful quality improvement program is a more efficient organization.

While efficiency can be considered "doing things right," effectiveness connotes "doing the right things."[73] Effectiveness is a measure of ability to attain set objectives, hence, an effective organization has the capability to produce a desired result.[74] Pursuing a TQM approach results in an organization setting its objectives based on customer requirements. As an organization improves its quality, it more consistently meets its objectives, which are developed with customer satisfaction in mind. The result, then, is an organization that more effectively satisfies the customer.

In industry, improving quality has the additional benefit of increasing market share. The most well-known example of increased quality resulting in increased market share is the impact on American industry by Japanese

manufacturers using a TQM approach.[75] A product or service that consistently meets customer needs and expectations will result in satisfied repeat customers. These customers also tell others about the product and expand the company's market share.[76] Furthermore, lower operating costs from increased efficiency can be passed along to customers in the form of lower prices, further feeding customer satisfaction.

## How TQM Works

As defined in Chapter One, TQM is a management approach that seeks to continually improve the quality of products and services in an organization. While the previous section addressed what TQM does for an organization, this section describes how it does it. The TQM approach comprises three dimensions of managing quality: the use of scientific methods, a focus on customer satisfaction, and a supportive organizational culture.[77]

In The Team Handbook, Peter Scholtes observes that the core of quality improvement is the use of a scientific approach. He describes this approach as a systematic way to gain information about processes, make decisions based on data, and reach permanent solutions by seeking root causes of problems.[78] In Putting Total Quality Management to Work, Sashkin and Kiser note "TQM tools help people collect and analyze data so they can solve quality problems and make continuous improvements."[79]

There are many tools, both statistical and non-statistical, available to help managers and workers in this approach. Run charts and control charts can help managers and workers identify problems in an ongoing process as soon as possible to prevent production of poor quality.[80] Flowcharts and fishbone diagrams can help determine causes for problems discovered on control charts and help start problem-solving.[81] Pareto charts can help prioritize efforts to improve quality in an organization or a process.[82] These tools, and others like them, help keep a "finger on the pulse" of processes crucial to an organization.

The bottom line about the use of scientific methods is that decisions under TQM are made based on hard data, not on intuition.[83] Quality improvements are developed and then tested; if they prove successful only then are they accepted.[84] As Deming notes in his sixth TQM principle, both management and the work force should be educated in statistical techniques.[85] The use of statistical techniques and TQM tools helps an organization ensure its processes provide the quality necessary to satisfy customers and help correct problems when they do not.

As observed earlier, TQM is customer-driven. This focus on the customer is derived from the definition of quality--consistent customer satisfaction. In order to provide quality products and services then, an organization

must determine customer requirements. There are many ways to remain in touch with customer requirements, but the most common include surveys (including focus groups and interviews), observations, and experiments.[86] These tools should be used continuously since customer needs and desires change over time.[87]

Only when an organization knows what the customer wants can it successfully design processes to meet those desires. Use of the scientific methods and TQM tools discussed above come into play after processes are designed for customer satisfaction in order to ensure those processes remain in control and continue to satisfy the customer.[88]

Sashkin and Kiser offer a recent example of a major organization losing touch with customer requirements. General Motors developed a heads-up display (HUD) system for automobiles similar to ones used in high performance military aircraft. The display flashes dashboard information (fuel, speed, etc.) on the windshield so the driver can see it without taking his eyes off the road. Despite the relatively low cost, however, only 1% of potential buyers ordered the product.[89]

Although determining customer requirements seems straight forward, it may not be as easy as expected. It can be especially problematic when an organization has difficulty identifying its customers. This is often found in service industries and the nonprofit world. In his

article "Adapting Total Quality Management (TQM) to Government," James Swiss argues that one of the main problems facing government managers is identifying the customer. More specifically, he argues, the problem is determining which customer should have priority over which other(s). In fact Swiss goes on to observe that for government agencies the ultimate customer, the general public, is often unconcerned about the service provided.[90] In Quality Management in the Nonprofit World Larry Kennedy concurs with Swiss regarding the difficulty in identifying customers.

> In the nonprofit world, the definition of our customer or client expands even further, because we have to satisfy the requirements not only of our clients but also of the contributor who pays for the service and anyone else in our community who has a reasonable interest in our client.[91]

There is another type of customer to consider when implementing TQM in an organization--the internal customer. In The Team Handbook Peter Scholtes argues that internal customers can be more easily identified when work is broken down into its component work processes. Each set of workers becomes a supplier for the next set, who are customers of the preceding set. Work processes are strung together until they reach an external (or ultimate) customer, who consumes the product or service.[92] Kennedy also comments on internal customers, noting "The definition of customer includes anyone for whom you are doing work, to whom you are supplying information, and so on."[93] Using his definition,

managers may be included as customers of workers, and vice versa.

In summary, pursuing a customer orientation in an organization means each function and division subordinate to the organization must identify its customers and determine their needs and expectations. TQM expands the concept of the customer through addressing each of the work processes in an organization. Whoever receives the results of internal work processes is an internal customer. The external customer consumes the final product or service.

The cultural environment is probably the most difficult aspect of an organization to change. Without a supportive organizational culture, however, the full potential of TQM will never be reached. Organizational culture as used in this context encompasses three areas: a firm organizational commitment to change, a long-term perspective for the organization, and a supportive management-worker relationship.

One of the reasons commitment to change is such an important characteristic for a successful TQM organization is evident in the definition of TQM. From Chapter One TQM is seen as an approach to continuously improve quality. Continuous improvement results in change and, as with all changes, organizational acceptance depends on leaders' support.

The term "organizational inertia" refers to the difficulties associated with making changes in an organization. The old saying "if it ain't broke, don't fix it" indicates an organizational mindset that runs completely contrary to the TQM goal of continuous improvement. The more an organization's culture stymies constructive change, the more important management commitment becomes to TQM success.

The quality experts recognize the importance of this commitment in implementing TQM in an organization. Crosby's first step to quality improvement is "Make it clear that management is committed to quality." He notes that people naturally observe their organizational leaders to monitor what pleases and displeases them. Because of the tremendous influence leaders have on our behavior, it is imperative that managers at all levels have a thorough understanding of TQM and a positive attitude toward quality improvement. In fact, Crosby goes beyond merely requiring management support of TQM to requiring management participation in TQM implementation.[94] Feigenbaum discusses the importance of organizational commitment in his three steps to quality. He argues that continuous motivation is required for success, and that training and inclusion of quality considerations in strategic business planning need to occur. In the first of his four deadly sins, he notes that organizations in which quality gets top-level attention only until something else

comes along never have successful TQM implementation.[95] Juran also stresses the need for strong organizational commitment in improving quality. He believes quality should become part of every management agenda, quality goals should be made part of the organization's strategic plan, and upper managers should regularly review progress against those goals.[96]

Another obvious reason management must be committed to TQM is the initial costs associated with its implementation. In addition to the support leaders must give to changing company philosophies, time and resources must go into TQM training for its success. In Managing the Total Quality Transformation, Thomas Berry lists ten top management actions to support implementation of TQM in organizations. They include approving the financial investment in TQM, providing and approving the time for TQM, requiring TQM training, and securing consulting help.[97]

Any change that requires management commitment, training, and cultural changes in an organization naturally requires time to take effect. TQM is no exception. Feigenbaum relates examples of companies that experience tremendous increases in market share and profitability after several years of TQM efforts.[98] In an article in National Productivity Review Jack Steele observes that "no bottom-line results should be expected from a TQM system for at least three to five years." He goes on to argue, however,

that full participation by senior management with prioritized TQM efforts could result in more rapid results.[99]

Deming sharply criticizes American industry's fixation on short-term profit as one of the major causes of quality problems in the country. In fact, three of his "seven deadly diseases" address the danger caused by a lack of long range planning: lack of constancy of purpose, emphasis on short-term profits, and mobility of management.[100] He notes these diseases hinder quality improvement by limiting long-term improvement efforts.

A short-term orientation also can result in organizations that tend to blame people for problems and to react to symptoms instead of correcting root causes (fire fighting). Deming states that 85% of all quality problems are beyond the capability of workers to correct. He believes that managers should focus on the work process inputs and the processes themselves instead of assuming the workers are the cause of problems.[101]

Deming's argument that workers can only correct a small proportion of problems in an organization leads to the final aspect of TQM culture. For TQM to flourish in an organization the culture of that organization should not only support a strong commitment to change and a long-term perspective, but should also support a relationship of teamwork between all of the functional areas and between

management and workers. A TQM approach fosters increased worker involvement in decision-making and an increase in teamwork.

Improving quality in an organization requires in-depth knowledge of the work processes that occur in the organization. Deming argues that people who work in the processes daily are more knowledgeable than are the managers who supervise the processes from several bureaucratic layers above. He observes that managers often are unaware of problems affecting the people who work for them.[102] Thomas Berry agrees, asserting in Managing the Total Quality Transformation that the best people to improve a process are those directly involved with the process. Berry notes that "those actually performing the work are in the best position to know what can be done better and how to achieve the improvements."[103] These arguments point toward empowering lower level managers, supervisors, and workers with the authority, responsibility, and resources necessary to make quality improvements in their areas.

Deming also argues that teamwork is a vital component to an organization's success. In his ninth principle he specifically addresses breaking down barriers between departments to better anticipate and solve problems.[104] He notes that without teamwork each staff area can develop suboptimized processes that work well within

functional areas but do not optimally support the overall goals of the organization.[105]

Under a TQM approach, the management-worker relationship moves toward a more participative style in which empowered teams develop improvement plans and management and workers at all levels view themselves as part of a company-wide team seeking continuous improvement. Workers become more involved in decision-making and team-building becomes a very important responsibility of management. Teamwork and cooperation within the organization help focus efforts on producing what the customer wants--quality.[106]

## The Process Action Team

TQM culture supports the use and empowerment of teams in an organization to identify problems and improve processes. Process Action Teams (PAT) are one of the primary tools used in the pursuit of quality improvement. Berry calls quality improvement teams the "guts" of the TQM process, stating "[quality improvement] teams are a vital part of a TQM system."[107] They are a vital component of the TQM process because they encompass each of the three dimensions of TQM: a customer orientation, use of scientific methods, and a TQM supportive culture.

Process Action Teams are groups of people working together in order to solve a problem or improve a process.[108] Teams typically consist of five to seven members. The

members are selected based on their knowledge of the problem or process being studied and their closeness to the process. Manning improvement teams with the people who work with the processes provides the added benefit of developing a sense of ownership over the solutions generated by the team. Having teams develop their own solutions helps prevent improvement efforts from dying after management attention moves on to another area of interest. The solutions developed by teams with highly involved members tend to be long-term solutions because the workers feel a sense of ownership; the improvements become "our" solutions instead of "their" solutions.[109]

A Process Action Team should also include members with the authority to make changes or the team should be empowered with that authority. This is critical to ensure the success of not only this particular team but of other team efforts throughout the organization. Enthusiasm quickly dies out when team solutions are not accepted by higher management or improvement recommendations are not implemented.[110] Including the right people on the team in the first place reduces this risk and speeds the improvement process--the team is empowered to implement the improvement as soon as it is developed.

Team empowerment has the additional effect of improving morale in an organization. Berry lists six organizational effectiveness benefits from implementing TQM,

including improved communication, increased employee involvement, lower employee turnover, and improved management-employee relations.[111]

Two key people in the team process are the team leader and the facilitator.[112] The team leader is normally a supervisor or manager in the process under study. He has a vested interest in the success of the team and the improvement of the process being studied. He calls team meetings, coordinates administrative support, and leads the team through each step of the PAT process. The facilitator assists the team by focusing its efforts, helping in the use of TQM tools, and developing teamwork through interpersonal communication and group dynamics skills.

Team members may be added or released as needed. Berry observes that the more sizable quality problems normally cross functional boundaries, so multi-functional teams result in more substantial, or at least, farther-reaching improvements.[113] Teams may also include customers, internal and external, as members of the Process Action Team. This supports the idea that a PAT's improvement efforts depend on satisfying the customer.

Berry notes that while traditional task forces seem similar to Process Action Teams, there are significant differences.[114] He states that task forces are normally staffed by more senior managers, who tend to unduly influence solutions toward personal goals. He also states

task forces fail to use sound scientific problem-solving methodologies in developing solutions, which often result in short-term improvements that soon fall apart. In contrast, teams apply a structured problem-solving process to uncover root causes of problems and develop long-term improvement strategies. Teams normally meet for an hour or two each week, and remain active until a long-term solution has been implemented, verified and the problem solved.

Total Quality Management provides for a formal structure to promote teamwork and the use of teams in quality improvement. Most of the quality experts propose at least two team activities for quality improvement in an organization.[115] The Army adopts three team activities as described in the Leadership for Total Army Quality Concept Plan. These activities are divided into top management (Executive Steering Committee), middle management (Quality Management Board), and worker (Process Action Team) responsibilities.[116] There is usually one Executive Steering Committee in an organization, which oversees several Quality Management Boards, which in turn charter several PATs on an as-needed basis.

Top management responsibilities include setting the strategic goals for quality improvement and evaluating quality improvement plans. The mid-level Quality Management Boards actually charter the PATs, select team members and determine the process(es) to be studied. As mentioned

earlier, workers, supervisors, and managers who are directly involved in the process to be studied are members of the Process Action Team.[117]

Scholtes observes that PATs generally progress through six stages during process improvement.[118] During the first meetings the team discusses its mission, its goals, and determines what process(es) it will study unless that has already been decided by the Quality Management Board. In this first stage the team also develops what Scholtes calls an improvement plan, which is an outline of how the team plans to attack the problem under study. The second stage addresses team-building and education of team members. Unless team members have worked together in the past, there may be group dynamic methods that can help them get to know one another and begin coalescing into a cohesive team. New PAT members may need training on quality issues and quality improvement tools, including some of the statistical tools available to study work processes.

Once the team is formed and trained, it begins the improvement process. During stage three the team describes the process being studied and looks for root causes. It begins to collect data on the process and uses the tools learned in stage two to identify sources of problems. Stage four begins the analysis of the data collected in stage three and the development of possible problem solutions. In stage five the team puts the solutions into place, making

changes to the process as needed. The team observes the results of the changes and evaluates the outcome. If the outcome is satisfactory, then in stage six the team either permanently emplaces the changes or recommends to management that the changes be made permanent. Stage six is the last stage of the PATs activities and includes evaluation of the team's success and closure of the effort.

An important aspect of the six-stage process followed by PATs is the fact that the improvement loop from stage three through stage five is an iterative process. During stage five, if the team observes that the changes do not meet their expectations, the team returns to stage three for additional data collection and stage four for additional solutions. This loop may continue many times until the team determines the final outcome is an acceptable improvement on the original process.

Scholtes' improvement loop is essentially the standard problem-solving process. The Plan-Do-Check-Act Cycle, what Deming called the Shewhart Cycle, is another way of describing this standard process.[119] Step one is to plan a change or a test aimed at improving the process under study. Step two is to carry out that change, preferably on a small scale or test basis. Step three is to study the results of step two and to evaluate the success of the change. Step four is to act on the information gained in step three. The possible actions to be taken in step four

include adopting the change if it works, abandoning the change if it does not work, or starting the cycle again, with another change. This iterative improvement process directly reflects the TQM approach toward continuous improvement.

## Summary

A review of the quality improvement literature provides several key pieces of information for the research. Based on the writings of the quality experts and observations from the secondary works in the field, there seems to be general agreement as to the definition of quality and what impact improving quality can have in an organization. There is evidence that a Total Quality Management approach to quality improvement can improve efficiency and effectiveness on work processes in any industry, including the military. As a result, Army leaders have adopted the TQM management philosophy, and are incorporating it throughout the Army with limited success at the tactical level.

The following example will illustrate the structure of team-based improvement efforts in a truck battalion. The Quality Management Board (QMB) may include the battalion commander, the executive officer and the operations officer; it may also include other primary staff officers. This group would identify problem areas within the battalion and name people to man one or more PATs to work on those areas.

Should the battalion's QMB believe quality in the area of highway operations needs improvement, it would charter a PAT to study the problem and develop improvement plans. The PAT might include members of the battalion highway operations staff who accept and pass truck missions to the companies, company operations personnel who receive those missions and forward them to the truck drivers, and the trailer managers who provide the trailers for each mission. The QMB lets the PAT members determine where to begin, or provides more focus to the problem if necessary. The PAT uses any of the many tools available to identify problems, develop corrective actions, test those actions, and then recommend or implement solutions.

Process Action Teams represent the three key components of TQM: a focus on customer satisfaction, use of scientific tools and methods, and a supportive culture. PATs are designed to solve quality problems and improve the quality of processes in an organization. They use statistical and non-statistical tools in an iterative problem-solving process and focus on internal and external customer satisfaction. Finally, their existence implies an organizational culture supportive of the teamwork and continuous improvement basic to a Total Quality Management approach.

## Endnotes

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## CHAPTER THREE

## RESEARCH METHODOLOGY

The purpose of this thesis was to determine the applicability of Total Quality Management in an Army truck battalion. The research employed a case study scenario and a Process Action Team simulation. It was conducted in two phases to answer the supporting research questions. The first addressed how TQM methods can be applied in a truck battalion and the second addressed whether or not the results of that application would improve operations. The research was designed to either support or refute the author's hypothesis that the use of selected TQM methods would improve highway operations in a truck battalion.

### Research Design

The author constructed a truck battalion case study based on his experience as the battalion operations officer in the 181st Transportation Battalion, Mannheim, Germany. The case study portrayed actual highway operations work processes in the battalion during the author's assignment there. It developed the general situation in the battalion, operational problems and attempted solutions already taken by the command, and resource constraints and limitations.

The author attempted to provide enough information in the case study for the reader to understand the processes and problems without introducing personal bias. The case was the primary source of information for the Process Action Team members during Phase One of the research.

Phase One consisted of a PAT simulation conducted at the Army Command and General Staff College (CGSC) in Fort Leavenworth, Kansas. Selected officers formed the PAT to study the truck battalion case study and develop recommendations to improve the battalion's operations. The outcome of this simulated PAT was used to determine whether TQM methods could be applied in a truck battalion. Successful application during the simulation implied applicability to a truck battalion and was used to answer the first of the supporting research questions.

The improvement recommendations developed by the PAT in Phase One were then evaluated by a separate panel of experts during Phase Two. These experts assessed the recommendations to determine whether they would be feasible in the battalion and whether they would actually improve the battalion's operations. Acceptance of the recommendations during Phase Two would imply the products of TQM methods can in fact improve battalion operations. The outcome of Phase Two was used to answer the second supporting research question.

## Phase One: The Process Action Team

Phase One required the selection of team members to take part in the Process Action Team simulation. Between five and seven student volunteers in the CGSC class were to be selected for participation. Initially, selection was limited to the 19 Transportation Corps students in the current (school year 93/94) CGSC class. The selection criteria were experience with Army truck operations and a willingness to participate in the research. The author contacted each of the 19 students to determine eligibility and interest. Six were ineligible based on experience (i.e., assignments in port operations, acquisition corps, aviation transportation, reserve units, or another branch altogether). Of the remaining 13, nine were not interested in participating in the simulation leaving only four to participate. In order to meet the author's goal of at least five members, an eligible officer from the CGSC staff agreed to participate as the fifth member. Ultimately, the simulated PAT was comprised of four CGSC students and one officer from the CGSC staff.

Each member of the PAT was assigned a duty position from the 181st Transportation Battalion to role play during the simulation. Roles were assigned based on the particular assignment history and expertise of each of the team members (i.e., the member with the most battalion operations staff experience was assigned that role). Team members were asked

to present arguments and points of view corresponding to their roles. In view of the battalion organization and the processes described in the case study, the author selected the following roles to be played in the PAT: the battalion's two medium truck company truckmasters (a sergeant first class), the battalion trailer point manager (also a sergeant first class), the battalion highway operations sergeant (a master sergeant position being filled by a sergeant first class), and the battalion highway operations officer (a captain).

Another member of the CGSC faculty played the role of team facilitator (or quality advisor) during the simulation. His responsibilities included training team members in Process Action Team methods and assisting in team-building and group dynamics. The author played the role of the chain of command as necessary during the simulation, and gave the PAT its general direction, resource limitations, and responsibilities.

The Process Action Team was scheduled to meet a total of nine times in January and February of 1994. The first two meetings were to form the team, become familiar with the case study, and provide the facilitator time to train the team in TQM methods. Team members were instructed to obtain a copy of The Team Handbook by Peter Scholtes, from the CGSC library to assist them in functioning as a Process Action Team. During the next six meetings the team

was to determine the processes to be examined and to develop improvement recommendations. The author conducted team member interviews during the last meeting and then disbanded the team.

## Phase Two: The Expert Panel

Phase Two of the research required selection of an Expert Panel of officers with experience in the 181st Transportation Battalion in order to assess the recommendations developed by the PAT. Three officers were selected: the previous battalion commander from the battalion, an officer who served as operations officer and executive officer in the battalion, and the officer serving as operations officer during the time frame of the research.

After the PAT developed its recommendations for the battalion, the author contacted each of the Expert Panel members separately for his assessment. Based on their personal experience in the battalion, the panel members evaluated whether the PAT's recommendations would have been feasible and acceptable in the 181st Transportation Battalion, and would indeed have improved the battalion's operations.

### Evaluation Model

The evaluation of the simulation during Phase One incorporated three sources of information: a final interview between the author and the PAT members,

observations of PAT activities by the author, and feedback to the author from the PAT facilitator. During Phase Two the evaluation was based on a subjective assessment of the PAT recommendations by the Expert Panel.

The final interview with the PAT was conducted as a group interview and focused on three areas. The first was the architecture of the simulation itself. The team was questioned about the PAT meetings, role-playing during the meetings, and the case study. To facilitate responses from team members the author prompted them to comment on the length, number, frequency, scheduling, and administrative support of the meetings. Concerning role-playing the author prompted discussion on the use and usefulness of role-playing during the simulation. Finally, the case study was discussed in reference to adequacy of information and level of detail.

The second area addressed during the final interview was the PAT process itself: the roles played in the process, the TQM training for the PAT, and whether the process would work in a bat on. First, the author prompted discussion about ould be the best people to serve on a similar PAT in an actual battalion. TQM training was discussed by asking how well the facilitator did his job and whether any of the TQM tools were used or considered useful. Finally, the team discussed the PAT process itself. The author asked if team members understood how the PAT

process was supposed to work, whether the members worked well together, if the process seemed too complicated or too slow for use in a battalion, and if they thought they had received enough focus and guidance from the simulated chain of command.

The third area included general comments by the team members. The author prompted discussion in this area with questions about whether team members thought the PAT process would work in an actual battalion, whether their recommendations would actually improve operations in the 181st Transportation Battalion, and whether they would consider using Process Action Teams in their next assignment.

The author's observations during the PAT activities were used to evaluate many of the same areas covered in the team member interview. The author observed the team-building process, the use of TQM tools and techniques, and the PAT process itself. Observations of the team-building process included noting administrative problems, such as scheduling, length, number, and frequency of meetings. It also addressed the adequacy of background information provided the team members, particularly the adequacy of the case study and the amount of additional detail required from the simulated chain of command.

The author observed the frequency of use of TQM tools to determine their usefulness in the process.

Additionally, he observed the PAT process as the team progressed through each of its meetings and developed its improvement recommendations. One specific item observed was the success of team member interaction and group dynamics--whether a particular member dominated the group or failed to participate. Other behaviors observed were: how well the team's efforts remained focused on the requirements as indicated by the case study and simulated chain of command, and how well the team used appropriate problem-solving methodologies.

While the facilitator served primarily as advisor to the team, he also made observations on group dynamics for the author. His observations covered the use of TQM tools and techniques and the team's problem-solving methodology. He monitored team member participation, particularly with regard to group dominance or lack of participation.

During Phase Two of the research, the author's interviews with the Expert Panel members provided information addressing the improvement recommendations developed by the PAT in Phase One. During these telephonic interviews, the author explained that the purpose of the interview was to obtain their assessment of each recommendation. The recommendations were described to each member, who was then asked his opinion of their feasibility in the 181st Transportation Battalion. The author asked each member to assess three aspects of the feasibility of

each recommendation: would the recommendation have worked in the battalion, would it have improved operations, and would he have accepted it.

The panel members were also asked to consider the difficulty of resourcing the recommendations and whether they would adversely affect other areas or functions in the battalion. Each member was then asked how familiar he was with TQM, and if he thought it would be appropriate in a truck battalion.

## Decision Criteria

Based on the data collected through personal observation, facilitator input, PAT member interview, and Expert Panel member interviews, the author then applied decision criteria to the findings. Results from Phase One were used to determine if the simulation failed or if the PAT process itself was unfeasible in a battalion. The Expert Panel's assessment was used to determine if the results of a PAT would be unacceptable in the case battalion.

The success of the PAT was based on information from each of three sources: the author, the facilitator, and the team members. Each source subjectively evaluated four aspects of Phase One. First was the formation of the simulated PAT, and the remaining three dealt with the PAT process: problem-solving, team training, and group dynamics. Should any of these four aspects be rejected by

one or more of the sources, the success of the PAT would be rejected.

Any major problem in the simulation that would cause the PAT process to be dysfunctional in a battalion was considered cause for rejection of the simulation. Examples include if the team could not work together, could not focus on the problem, or could not develop a coherent recommendation plan. Problems due to the nature of the simulation itself would not result in rejection if it was determined their cause would not exist in an actual battalion (e.g., role-playing). Additionally, minor PAT problems that could be overcome with practice would not be cause for rejection.

The Expert Panel's rejection criteria for the PAT's recommendations were also based on the subjective judgement of panel members. Panel members would reject specific recommendations that failed either of three questions: would the recommendation have worked, would it improve operations, or would it have been accepted. For each of the processes studied by the PAT, the majority of the specific recommended actions would have to be rejected for the entire process recommendation to be rejected. Rejection by any one of the panel members was considered final. Although this rejection criteria is conservative, it models an actual battalion environment in which a recommendation could be disapproved by anyone in the chain of command.

Finally, a method to measure the overall success of the research was needed. Based on the procedures described above, if either phase resulted in rejection, then TQM methods would be considered inapplicable in a truck battalion. However, the success of both phases would be considered evidence in support of the hypothesis that TQM would improve operations in a truck battalion.

The following situations illustrate the use of the decision criteria. First, should either the team members, the author, or the facilitator observe some aspect of the PAT process that would prevent it from working in an actual battalion environment, this would subjectively result in rejection during Phase One. If, however, they observe problems with the simulation that would not have occurred in an actual battalion, the process would not be rejected.

A Phase Two rejection would occur if any of the panel members subjectively rejected more than half of the processes studied by the PAT. The recommendations were consolidated by process, with several specific actions under each process studied. To reject the improvement plan for an entire process more than half of the specific recommendations for that process would have to be rejected. As an example, should the team develop improvement plans for three processes with five specific recommended actions under each process, a panel member would have to reject at least three of the specific actions to reject an entire process

improvement plan. To reject the entire PAT improvement effort, two of the three process improvement plans would have to be rejected.

## Threats to the Research Design

Early in the design of the research the author identified three categories of possible threats to the soundness of the methodology: lack of validity, objectivity, and completeness. Possible threats to the research's validity were inadequate representation of TQM methods by the PAT process, and inadequate representation of an actual battalion PAT by the simulated PAT conducted in Phase One of the research. Objectivity was threatened by possible introduction of bias by the author, the PAT team members, or the Expert Panel members. The limited time available to complete the PAT was the final threat to the research. Several steps were taken in order to minimize the impact of these threats.

First, the validity of using the PAT process to represent TQM methods had to be justified. As indicated in Chapter Two, the quality experts promote the use of teams in their quality improvement strategies. Crosby and Deming address teams and team-building in their quality improvement steps.[1] Juran describes an organizational structure for quality improvement that incorporates quality improvement teams.[2] Ishikawa is a strong proponent for the use of teams in quality improvement; he is the originator of the quality

circle concept.[3] In The Team Handbook, Peter Scholtes argues that the use of teams is one of the key elements of success in implementing TQM.[4] He also observes that teams have the additional purpose of educating an organization in TQM methods, and that success in this role can be more important in the long run than improvement of a particular process.[5]

In addition to support from the quality experts, the Process Action Team incorporates each of the dimensions of TQM as explained in Chapter One; it is fair therefore to consider it a valid and representative demonstration of TQM. First, the focus of the PAT is on customer satisfaction, for as Scholtes points out the primary purpose of a PAT is to improve the quality of a process.[6] Since quality is derived from customer satisfaction, that is where PATs focus improvement efforts. As far as incorporating the use of scientific methods and tools, Scholtes devotes an entire chapter of his book to describing how TQM tools and the scientific approach are used by PATs to accomplish their goals.[7] Finally, the very existence of quality improvement teams in an organization indicate the type of organizational culture supportive of TQM efforts. Sholtes notes that the existence of teams serves to improve the cross-functional spirit of teamwork in an organization that is so important to a TQM-supportive culture.[8]

Besides justifying the use of the PAT process to represent the larger application of TQM, the simulated PAT had to be shown to be a valid representation of an actual battalion PAT. The research design, therefore, included measures to support the validity of the simulation. First, the author developed the case study from the actual situation he observed while assigned to the battalion. Second, while the PAT team members had no direct experience in the case battalion, they were each selected to play the roles most suited to their experience in other operational truck units. Additionally, assessment of the PAT results were conducted by Expert Panel members with direct experience in the case battalion.

Several steps were taken in the research design to limit the introduction of bias. The development of the case study was the first area of concern. The author based the case on his experiences as operations officer of the 181st Transportation Battalion. The problems addressed in the case were actual problems affecting the battalion's operations during his assignment there. More detailed information required by PAT members for improvement recommendations was provided by the author only if it was information the member would have available in his role in the battalion. Reconstructed numerical data would be provided the PAT on the same basis, and used only to illustrate points or problems that would have been evident

to actual members of the battalion. Examples of the type of information provided to PAT members include unit formation times, equipment maintenance data, personnel strength, etc.

There was another opportunity for introduction of bias in the selection of PAT team members. As addressed above, carefully screened Transportation Corps officers were selected to participate in the PAT simulation. Assignment histories for team members included truck assignments in Korea, Germany, and CONUS in positions from platoon leader to highway operations staff officers. This variety of expertise reduced the probability of any team member dominating the activities based on personal experience. Further, the team facilitator, a CGSC instructor with experience in group dynamics, was responsible for limiting any such group dominance by individual team members.

As a final effort to minimize bias in the research design, the Expert Panel was incorporated as a third party to assess the results of Phase One. Whereas PAT members were selected from more junior officers with a broad background in different units, panel members were selected from more senior officers with operational experience in the 181st Transportation Battalion. This step acted as a sort of "honest broker" for the PAT, and focused the research on the case battalion.

The last area of concern in the research design was the amount of time available to complete the research. Due

to constraints on CGSC student officers' time and scheduling constraints within the college curriculum, only nine meetings of approximately two hours in length were allocated to completion of the PAT process. As Scholtes points out in The Team Handbook, actual PATs do not have mandatory completion dates unless some extraordinary circumstance requires it.[9] Berry, in Managing the Total Quality Transformation, notes that a quality improvement team should stay intact until its project is complete.[10] For the purposes of the simulated PAT, however, the scope of the processes studied for improvement were necessarily limited by the time available.

Additionally, both Berry and Scholtes maintain teams should follow problem-solving methodologies[11] that were not possible in the simulation due to the limited time available. The four-step process most often cited in the literature is Deming's Plan-Do-Check-Act (PDCA) cycle, which Sashkin and Kiser observe is nothing more than a straightforward rational problem-solving process.[12] In this cycle, the first step is to plan a change or test aimed at process improvement. The second is to carry out the change, preferably on a small scale such as an experiment. Third, check the results of step two to see if improvements actually were made. Finally, act on the results--either adopt the change, abandon it, or begin the PDCA cycle again.[13] During the simulation in Phase One of the

research, time constraints allowed only the planning step of the cycle, since the remaining steps would have required making physical changes in the case battalion. The Expert Panel assessment was designed to subjectively determine the results of the next three steps without actually conducting them.

## Summary

The research was designed in two phases to address the two supporting research questions. Phase One was a simulated Process Action Team comprised of CGSC students with truck operations experience. The team used TQM methods to develop improvement recommendations based on a case study from the 181st Transportation Battalion. During Phase Two an Expert Panel of officers with experience in the battalion assessed the feasibility of the improvement recommendations.

Findings from Phase One of the research included the author's observations of the PAT activities, the facilitator's notes on the PAT, and feedback on the process by the team members themselves. Phase Two findings were an assessment of the PAT recommendation plans. Rejection criteria were then applied to the findings to determine whether a PAT would work in a truck battalion, and whether the results of the PAT were likely to improve the battalion's operations.

Measures were taken to address each of the possible threats to the validity, objectivity, and completeness of

the research design. The Process Action Team was selected to represent the TQM approach because it incorporates each of the three dimensions of TQM. The author based his input on his actual experiences in the case battalion, and PAT members were screened to include a broad experience in U.S. Army truck units. The most important design measure was the inclusion of the Expert Panel member assessment of the PAT results, since their experience in the battalion under study allowed them to most accurately assess the probable success or failure of the PAT's recommendations.

## Endnotes

[1]Bruce Brocka and M. Suzanne Brocka, Quality Management: Implementing the Best Ideas of the Masters (Homewood, Ill.: Business One Irwin, 1992), 62, 67.

[2]Ibid., 82.

[3]Ibid., 78.

[4]Peter R. Scholtes, The Team Handbook (Menasha, Wis.: Banta Corporation, 1991), 1-4.

[5]Ibid., 1-18.

[6]Ibid., 1-17.

[7]Ibid., 2-1 through 2-46.

[8]Ibid., 2-7.

[9]Ibid., 3-16.

[10]Thomas H. Berry, Managing the Total Quality Transformation (New York: McGraw-Hill, 1991), 58.

[11]Ibid., 63-70, and Scholtes, 5-31.

[12]Marshall Sashkin and Kenneth J. Kiser, Putting Total Quality Management to Work (San Francisco: Berrett-Koehler Publishers, 1993), 44.

[13]Scholtes, 5-31.

# CHAPTER FOUR

# ANALYSIS OF FINDINGS

This chapter presents the research findings in two sections, one for each phase of the research. The first section addresses the formation of the team, training for the PAT activities, and the PAT activities themselves. There were three sources of information in Phase One: the author's observations, additional observations from the PAT team facilitator, and feedback from the team members themselves. The three Expert Panel member interviews were the source for Phase Two of the research, which addressed the results produced during the first phase.

Information from each of the sources was analyzed in order to answer the two supporting research questions: "How can TQM methods be applied in a truck battalion?" and "Would the results have improved the case battalion's operations?" Together the supporting questions provide the answer to the primary research question: "Can the use of TQM methods improve operations in an Army truck battalion?"

## Phase One: The Process Action Team

The first problem faced in the research was identifying an adequate number of volunteers for the

simulated Process Action Team. Only four of the 13 eligible CGSC officers agreed to participate in the research. This low participation rate may be indicative of a problem that might face an actual unit attempting to initiate a PAT. To overcome this problem, Berry notes improvement teams should assign employees to participate rather than count on volunteers, especially when an organization's TQM process is new.[1] Although participation had to be extended to include a member of the CGSC staff, the goal of five to seven members was met.

During the early meetings, scheduling was another issue. It was difficult initially for each of the members (and the facilitator and author) to determine a suitable meeting time for subsequent PAT meetings that fit into everyone's schedules. This problem may have been exacerbated in the school environment since students do not have control over their own schedules and could not adjust their classes to work around the PAT meetings. After the third meeting, however, the group settled on a standard time and place.

The team meetings were 60 minutes long except for meeting four when members stayed almost 90 minutes due to open CGSC class time after the scheduled PAT meeting. The team worked through the entire hour of each meeting without a break, and often had to abruptly end the meeting at the end of the allotted time. The first five to ten minutes

were normally unproductive as it usually took that long for all members to arrive and settle in their seats. During the final PAT interview the team members noted they felt the ideal meeting length would have been 90 minutes, rather than 60 minutes. They felt the extra time would have allowed them to be more thorough in their work and would have given them more time to organize their efforts. They also recognized they should have set an agenda at the beginning of each meeting to help organize efforts and should have set aside time during the meetings to assess their progress along the way.

The meetings generally followed the sequence of events as recommended by Peter Scholtes in The Team Handbook: clarify goals, build the team, describe the process, analyze data and seek solutions, take corrective actions, and close out the project. The team conducted several iterations of the improvement loop (steps three through five); one for each process studied.[2]

During the first meeting, team members were encouraged to read The Team Handbook to become familiar with PAT procedures and TQM problem-solving techniques. Scholtes recommends the following activities for a PAT's first meetings: getting to know other members, team-building, setting administrative details and ground rules, training on the TQM approach and tools, and understanding the requirements of the PAT.[3] As recommended, activities during

the first meeting were mostly administrative, and included identifying who would play which battalion role, familiarizing members with the case study and each other, and scheduling the next meeting.

While the facilitator was not available to conduct TQM training during the second meeting, the author filled in for him and presented some background TQM information and training (as taken from the Scholtes handbook). The team seemed anxious to begin work and started to identify problems and possible solutions from the case study almost immediately. The team leader stopped the group from solution development and steered them back toward the first improvement loop step of describing the process. Although the author observed this behavior twice during the second meeting, the team leader skillfully refocused the group each time. By the end of the second meeting the team had developed a list of nine problems from the case study they intended to study and correct.

Most of meeting three was spent consolidating the list of nine problems to seven, and developing an overall mission for the Process Action Team. Scholtes lists several questions a mission statement should address. They include such questions as: is the mission clear and realistic, are the project boundaries clear, are the right people for this project on the team, and will improvements in this area support the organization's overall efforts.[4] The mission

statement the team developed was to "find the best way to manage the battalion's trailer fleet." The team agreed their mission statement adequately addressed Scholtes' questions and would serve to get them started on the problem-solving process. In his role as the battalion chain of command, the author approved the mission since it appropriately focused the team's efforts on the most critical aspect of the battalion's operational problems as illustrated in the case study and the appropriate battalion roles were represented by team members.

The team conferred with the author (again, role-playing the chain of command) to help set the project boundaries as recommended by Scholtes. In developing the mission statement the team asked the author how much control the battalion operations officer exercised over the battalion's trailer management process. The author indicated that based on the command climate in the battalion, the operations officer could assume as much control over trailer management as he wanted. The team also asked if it would be possible to eliminate the battalion's consolidated trailer management function and return control of the fleet to the individual companies. Again based on his experience the author indicated the battalion commander would not have accepted that option.

During meeting four team members again narrowed their focus on what they determined to be the three most

important processes to achieving the PAT's missions: trailer maintenance, accountability of trailers, and issuing and receiving trailers. Scholtes recommends selecting processes that: impact on external customers, cycle frequently for rapid results, are fairly simple rather than complicated, and that are important to customers and management.[5] Based on these guidelines for project selection, the team selected processes with a high chance for a visibly successful first project. During their discussion, team members noted that these three processes would probably realize the greatest return on their efforts, and would definitely be important to customers and the chain of command.

Beginning with meeting four the PAT began working in the iterative process improvement loop, or Plan-Do-Check-Act (PDCA) cycle, in earnest. The team developed a flowchart to describe how missions were received by the battalion and passed through the companies down to the truck drivers and trailer managers. The team members used the flowchart to identify sources of problems in the process. In the following meetings they addressed each of the problem sources identified in meeting four and developed recommendations for improvements.

Once a PAT has decided what processes it will study Scholtes offers a five-step plan for improvement. These five steps result in the "Plan" portion of the

Plan-Do-Check-Act cycle. The first step is to fully understand the process, both how it currently works and what it should do (to satisfy the customers who depend on it). Understanding these aspects of the process gives the team a goal so it can develop an improved process for testing (the "Do" step). The second step continues the efforts to develop an improved process by eliminating process errors through error-proofing. In the third step the team streamlines the process by eliminating any slack in the system. Step four reduces process variation to reduce variation in the quality of the output of the process. What Scholtes calls his fifth planning step becomes the PAT's plan for testing its recommended improvements developed from the four previous steps. The team then moves on to the "Do" portion and continues on the PDCA cycle.[6]

The simulated PAT followed Scholtes' five-step plan for improvement fairly well. During the fifth through eighth meetings the team became very proficient in using flowcharts to assist in understanding the process. The team developed a flowchart (two in meeting seven) at the beginning of each of these meetings in order to model the process they would study that day. The flowchart served to keep all team members focused during the meeting and readily highlighted obvious problems within the process. The meetings usually started with team members and the author jointly developing the flowchart. If the team recommended a

step but the author informed them that step did not currently exist in the case battalion, further discussion ensued--normally with a recommendation to modify the process to include that step. Several of the PAT's final recommendations were developed in this manner, such as the recommendation in meeting six to provide customers with copies of Trailer Interchange Receipts (TIR), in meeting seven to include trailer bumper numbers on mission sheets, and in meeting eight to close out the battalion mission log after mission completion.

The team also used the flowcharts as backdrops to discuss ways to eliminate errors in the process. Based on information from the author about the frequency of different problems, the team determined where error-proofing would be most effective. Examples of this occurred during meeting five when the team recommended a segregated parking area for "ready to issue" trailers to prevent the frequent accidental issue of trailers with maintenance problems, and during meeting seven when it recommended that drivers not pick up a different trailer from the one listed on their mission sheet without calling the trailer managers for approval first. Each of these improvements were designed to help eliminate errors occurring in the process.

The recommendation for segregated parking areas for different categories/conditions of trailers also helped accomplish step three of the improvement process--the

streamlining step. As a result of this procedural change, the daily trailer issuing process would be streamlined for each of the drivers who would no longer have to search the entire trailer park for their assigned trailer.

Because the PAT did not have access to numerical data from the case battalion it was not possible for them to measure or reduce variation in the processes under study. Also, as noted in the research design, the team was not expected to be able to move along in the PDCA cycle past the planning step. Each of the recommendations from the PAT comprise only the initial plans which, in an actual situation, would then be tested (in the "Do" step), Checked and Acted upon.

Throughout Phase One of the research the team's process improvement activities seemed to work very well. There were some instances during the first meetings when the team seemed unsure of the next step, e.g., after the team had completed the first overall flowchart in meeting four the team leader asked the author what to do next. The author referred him to the facilitator, who suggested they further refine the process and study it for possible improvements. Once past that initial stumbling block, however, the team developed an improvement loop routine and looked at a different process each meeting.

Group dynamics during the PAT's activities worked surprisingly well. Both the facilitator and the author were

surprised at how quickly the group was able to work together as a team. There were no observed instances of a team member exerting dominance over the group or failing to participate in the activities. The team facilitator observed that a possible reason for the excellent group dynamics is the fact that much of the CGSC curriculum is based on small group instruction and the PAT members were well-accustomed to working in and forming work teams. Another possible reason is that the members in the simulation were only playing roles and lacked the emotional involvement real PAT members might feel in a battalion.

Feedback from PAT members indicated that role-playing did not work well in the simulation. The primary cause seemed to be the lack of detailed knowledge of the systems and processes in the case battalion. This is related to the lack of emotional involvement discussed above. Unless each team member knows how each process affects him and his soldiers, there is a lack of conflict and resolution in the PAT process. During the final interview the team members recommended providing a separate case study to each member slanted with different information for each of the battalion roles to be played. This information could include competing requirements between the members and therefore instill additional conflict in the PAT process.

Related to the issue of role-playing was the lack of detailed knowledge about the battalion's processes and standard operating procedures. During the final interview team members noted they had difficulty improving a process they did not fully understand. Additionally, the author could not afford to provide too much detail about the processes under study to preclude introducing personal bias into the PAT. Not having the actual battalion personnel available may have kept the simulated PAT from achieving its full potential effectiveness and developing detailed comprehensive improvement plans.

Another factor that may have reduced the effectiveness of the simulated PAT was team members' reluctance to use many of the available problem-solving tools. The team became very efficient at using flowcharts to describe processes, but balked at suggestions (by the author and the facilitator) of further use of tools. Although in the early meetings both the author and the facilitator recommended the team ask for numerical data on the processes under study (the data would then be fabricated by the author simulating collection by the PAT from the actual processes), the team never asked. Later, in another effort to expand the team's use of tools, the author pointed out to the team that a cause and effect diagram would help illustrate the causes of problems noted in the outbound trailer check process in meeting five. However, the team

diregarded the suggestion and continued to list possible problem causes without the use of that particular tool. The facilitator noted that a possible cause for this reluctance to use many of the TQM tools was a lack of adequate training in their use. Team members, however, indicated they saw no need for additional training because they did not have data requiring use of the tools.

During the final interview with PAT members, the author asked the team how well they felt the process worked for them and whether it would work in an actual battalion. They all agreed the simulated process worked well and felt it would work equally well in actual use. However, they offered several caveats and suggestions. They noted the importance of the team facilitator, especially in the early stages of the PAT's efforts, in keeping the team focused and guiding it through the team problem-solving steps. They also pointed out the ideal facilitator would be a TQM-trained person from outside the battalion, e.g., from the installation or higher headquarters.

They noted that it would be helpful to include external battalion customers and battalion maintenance personnel as members on an actual PAT. They also noted the best person to chair the meetings (as team leader) would be the same as in the simulation--the assistant battalion operations officer (a captain). They felt the rank of captain would help resolve any problems within the group and

reinforce the importance of the entire process. Although Scholtes agrees team leaders are normally supervisors in the area under study, he notes that this requires them to take extra precautions to avoid dominating the group during meetings.[7]

While the team members all said they would attempt to use the PAT process in their next assignments, they noted the importance of support from the chain of command for the process to be successful in the long run. They pointed out problems to be overcome in a battalion such as rapid personnel turnover, lack of motivation for new ways of operating, and rapidly changing missions and work environments. They recommended starting with smaller, easy-to-solve processes and then progressing to larger, more complex ones, just as Scholtes recommends in his handbook.[8] As a minimum, they felt the battalion operations officer should show personal interest in the success of PAT's efforts by attending or at least starting some of the meetings. Inauguration of the first meeting by the battalion commander himself would help motivate the non-commissioned officers from the different companies and staff sections to fully participate.

Based on the criteria from Chapter Three, the simulated PAT was judged a success with minor problems. Each of the three sources--team members, the facilitator, and the author--concurred on the minor problem areas. The

most important one was the lack of detailed information on the processes under study. This simulation problem would not occur in a battalion because the team members would be actual soldiers from the battalion, and would not have to rely on information from a case study.

The lack of time for additional meetings and the team's reluctance to use TQM tools were also simulation problems that could be overcome in a battalion. The availability of numerical data from the processes under study, and the ability to progress through the PDCA cycle to completion (i.e., develop and test solutions) would allow an actual PAT to develop more detailed solutions to the battalion's problems. Where the simulated PAT had neither the time nor the data, an actual PAT could collect numerical data to identify a problem, test a possible solution, and validate the solution.

Finally, administrative problems should be more easily overcome in an actual battalion PAT. Selecting the best qualified people to become team members, and scheduling meeting times and lengths should not pose a problem in a battalion if the chain of command supports the PAT process. This underscores the importance of a supportive chain of command making the team's efforts a high priority.

## Phase Two: The Expert Panel

The three officers who made up the Expert Panel each assessed the recommendations from the PAT based on their

personal experiences with the personnel and processes in the 181st Transportation Battalion. They evaluated each individual recommendation with regard to whether it would work in the battalion, whether it would have improved operations, and whether they would have supported it. They also discussed their thoughts about TQM, and its applicability in a truck battalion.

The first officer interviewed was the previous commander of the case battalion. Lieutenant Colonel (LTC) James Stordahl agreed with the team's recommendations concerning the outbound trailer flow from the motor pool. He definitely thought controlled access to the trailer park was a good idea, along with the other specific recommendations made in this area. While he did not think it possible to assign a parking space for each trailer in the battalion (there is not adequate space), he agreed that assigned locations by type or category would help trailer management operations and he would have approved the recommendation.

In the area of customer interface, LTC Stordahl agreed with each of the suggestions except assigning responsibility for customer interface to each of the companies. He did not think decentralizing this responsibility would improve operations and would not have approved it. He felt there was not enough stability in the mission workload for a single truck company to develop a

satisfactory relationship with any particular customer, and that responsibility should remain at the battalion level.

LTC Stordahl had no problems with any of the specific recommendations made in the areas of Trailer Interchange Receipt usage or nightly trailer yard check procedures. However, in the final area of the battalion's mission close-out process he did not think the additional requirement of closing out the mission log and filing the mission sheets would serve to improve operations. While he did not think this recommendation would improve operations, he would not have disapproved it.

After the assessment of the PAT's improvement recommendations, the author asked for LTC Stordahl's thoughts on Total Quality Management. Stordahl commented that he had very limited knowledge of TQM (or TAQ) while he was battalion commander, but has learned something about it since working in the office of Base Operations, Headquarters, U.S. Army Europe (USAREUR). He has seen the positive effect of TQM in a staff organization where the personnel were more mature and experienced. He thought TQM would work at the group (brigade) level, but would be more difficult to implement at the battalion level unless the battalion commander understood how it worked and was dedicated to its success. He noted he would try it if he commanded a battalion again, or a group. He felt the biggest problem with implementing TQM in an actual battalion

was the intensely rapid pace of operations and change at that level. He thought TQM could be used in developing training in a battalion, or on other battalion processes that were relatively stable over time.

The second interview was with LTC Bill Key, who served consecutively as battalion operations officer and executive officer in the case battalion. He agreed with the PAT's recommendations in the area of outbound trailer flow, and observed that was the same solution used by other truck battalions in USAREUR. Like LTC Stordahl, he pointed out that there was not enough room for a separately identified parking space for every one of the battalion's trailers. He did think parking them by category would be helpful to the trailer managers, truck companies, and maintenance personnel.

In the area of customer interface he agreed with each of the specific recommendations, but thought the idea of assigning companies the responsibility for customer interface would only work in special cases where there was a demonstrated, stable, customer workload assigned to one truck company. He was not certain that recommendation would improve operations unless the workload supported it over a long enough period of time to establish a working relationship between the truck company personnel and the customer.

LTC Key strongly supported the recommended changes in the area of Trailer Interchange Receipt usage. He noted there might be a problem initially with gaining acceptance by the customers, but thought the recommendations would definitely improve operations. He also supported the nightly trailer yard check recommendations, in spite of the possible requirement for additional personnel. LTC Key was as skeptical as LTC Stordahl about the usefulness of closing out the battalion mission log. While he did not feel it would help improve operations, he would not have disapproved the recommendation.

Like LTC Stordahl, LTC Key learned about TQM after leaving the battalion. In his current assignment at the U.S. Transportation Command (USTRANSCOM) he has become familiar with TQM and its capabilities. Also similar to LTC Stordahl, he felt it would work best if supported by the battalion commander. He noted the battalion commander should be the one to inaugurate PATs in the battalion to show his commitment, and should support the recommendations developed by the PAT so team members would not lose interest in the program. LTC Key cautioned that without adequate training, team-building, facilitator support, and commander's influence, the possible conflict between the personalities involved in the PAT might disrupt the effectiveness of the team. He indicated that from what he

has learned about TQM at USTRANSCOM he would try implementing it as commander of a truck battalion.

The final panel member to be interviewed was Captain-promotable (CPT) Mike Norkus, who is the current operations officer for the battalion. CPT Norkus also agreed with all the specific recommendations in the area of outbound trailer flow. While he questioned the need for a fenced off trailer park, he agreed with the need for controlled access through the gate. He definitely supported the audit trail recommendation of drivers being released on the form DD1970 before returning to their companies at the end of the day.

In the area of customer interface, CPT Norkus did not support the idea of assigning customer interface responsibility to the truck companies. He felt this recommendation would not work because the companies do not have a stable workload or relationship with any one customer. Too many other requirements would prohibit the establishment of this type of long-term support relationship. However, he definitely supported the recommendation of using a battalion representative to continuously visit customer sites to develop a working customer interface process.

CPT Norkus agreed with all the recommendations in the area of Trailer Interchange Receipts, and commented on the importance of having adequate telephones for the trailer

managers with access to the German commercial telephone system. He also agreed with all the recommendations made in the area of the nightly trailer yard checks.

CPT Norkus differed from the other panel members in his assessment of the recommendations for the mission close out process. While the other two members did not think closing out the mission log and filing the completed mission sheets would serve to improve the battalion's operations, CPT Norkus did. He noted that the battalion frequently needs historical information on mission workload by location. He said this information is currently being used to support base closure decisions in the USAREUR force drawdown operations.

CPT Norkus differed from the other panel members in two additional ways. He was more supportive of the TQM approach in a truck battalion than were the other members, and he was more knowledgeable about TQM than the others while in the battalion. He noted he first learned about TQM while at the Transportation Corps Center at Fort Eustis and again while working on the USAREUR staff before being assigned to the case battalion. He said he believes TQM definitely works in a truck battalion and that he uses it in the 181st Transportation Battalion for developing and coordinating plans for major events (such as the Corps Support Command Truck Rodeo competition) and for developing operations orders and plans for large truck missions on a

daily basis. He said he includes other staff members on teams when planning large activities that involve more than just the battalion's operations staff.

Looking at the overall results of the panel's assessment, the outcome was a qualified success. LTC Stordahl and LTC Key both rejected the recommended changes to the mission close out process based on failure to justify its capability to improve operations in the battalion. Based on the decision criteria in Chapter Three, the recommendations for the mission close out process were thereby rejected.

All three of the panel members questioned one of the recommended changes in the customer interface process, specifically the recommendation to develop a special customer relationship between selected customers and truck companies. Although they each felt this particular recommendation would not work in the battalion, the remaining recommended changes to the customer interface process were all approved, so the overall process recommendation was accepted. Additionally, in addressing the outbound trailer flow process, each of the panel members questioned the ability of the battalion to provide an assigned parking place for each of the battalion's trailers. However, they approved the idea of setting aside places for trailers by type, and the other specific recommendations for the trailer process were all accepted.

As discussed in the analysis of Phase One, the lack of detailed process knowledge by PAT members may have caused the team to develop recommendations that were determined to be unfeasible by the Expert Panel. Adequate understanding of the processes and situation in the case battalion would probably have prevented these recommendations. Battalion personnel would have known there was not enough parking space in the battalion motor pool for all the battalion's trailers, and would have known the truck companies do not have a stable enough workload for any particular customer to warrant establishing a special customer relationship.

Based on the criteria developed in Chapter Three, the PAT's overall recommended improvement plan was a success in spite of this lack of knowledge of the battalion's processes. In summary, the recommendations for four of the five processes were accepted by all of the panel members, and one was rejected by two of the panel members (see Appendix C, Table 1, on page 147).

## Summary of Findings

Both the simulated Process Action Team and the recommendations it produced appeared to be successful. The research faced minor administrative difficulties that were easily overcome during the simulation (such as the scheduling of meeting times), and developed some recommendations for an improved simulation (such as developing a separate case study for each role player and

extending the meeting length to 90 minutes). Additionally, identifying qualified volunteer PAT members for the simulation would not have been an issue in an actual battalion because the members would most likely have been assigned without volunteering.

Some of the simulation's difficulties were more serious in nature, primarily resulting from the role-playing aspect of the research. The effect of the role-playing seemed to have a cascading effect on the PAT simulation, ultimately causing the development of PAT recommendations that were not accepted by the Expert Panel. Since the PAT members were playing the roles of case battalion personnel, they lacked the adequately detailed process knowledge necessary to develop detailed, acceptable improvements. This lack of knowledge of the processes under study may also have been a factor in the team's reluctance to collect simulated data during their study of the battalion's processes. Without numerical data, the team had little use for many of the TQM tools available for data analysis. Furthermore, since team members never used the more sophisticated TQM tools in the process, they felt they had no need of training on the use of the tools.

While these more serious difficulties may have threatened the success of the simulated PAT, the root cause (role-playing) would not be a problem in an actual battalion. Actual battalion personnel would be more

familiar with battalion processes and would be less likely to develop recommendations that were physically impossible (such as a parking space for all the battalion's trailers in the motor pool). Battalion personnel, with information more readily available, would also be more likely to collect and use numerical data during their PAT activities. To analyze the data, more of the TQM tools would be used, resulting in the need for more TQM training. In an actual battalion, the cascading effect of role-playing would be unwound, providing a more conducive environment for the PAT process to operate more effectively.

While for the most part it seemed role-playing caused problems in the research that would not be found in a battalion, there is one aspect that seemed to be missing in the simulation that could cause problems for an actual PAT. The lack of emotional involvement with the issues in the processes under study was primarily due to the role-playing aspect of the research. In an actual situation, with the real battalion personnel involved in the PAT activities, there would most likely be more friction to be overcome by the team. Although the amount and intensity of dissent would depend on the situation (the nature of the process under study, how proposed recommendations affect the people involved, the personalities involved, etc.), the team leader and facilitator in an actual PAT would probably have to deal

with the disruptive effects of more emotional involvement in team members than they did in the simulation.

In spite of some initial difficulties in progressing through the problem-solving methodology used by the simulated PAT, the PAT process itself seemed to work very well. Team member feedback and observations by the author and facilitator indicated no problems in forming the team or in group dynamics. Team members readily used flowcharts to describe the battalion processes, and the steps for moving through the process improvement loop quickly became routine.

Since the problems encountered in Phase One were either minor or would most likely not be a factor in an actual battalion PAT, the simulation was considered a success. The results of the PAT were then assessed by the Expert Panel, who judged the recommendations for all but one of the five processes studied to be acceptable.

## Endnotes

[1]Thomas H. Berry, Managing the Total Quality Transformation (New York: McGraw-Hill, 1991), 4.

[2]Peter R. Scholtes, The Team Handbook (Menasha, Wis.: Banta Corporation, 1991), 4-39.

[3]Ibid., 4-15.

[4]Ibid., 4-31.

[5]Ibid., 3-3.

[6]Ibid., 5-19.

[7]Ibid., 3-9.

[8]Ibid., 3-3.

# CHAPTER FIVE

## CONCLUSIONS AND RECOMMENDATIONS

The Army's senior leaders have embraced the TQM approach and have successfully implemented it in the non-tactical arena--in installation management, health services, and the strategic logistics base. However, there have been only a few signs of TQM use in tactical units and on the operational side of the Army.[1] This thesis has attempted to determine the applicability of TQM in a truck battalion.

The purpose of the research was to determine if TQM can improve truck battalion operations. This was addressed through the two parts of the research, each of which determined the answer to a secondary research question. The first asked how TQM could be applied to the processes in a truck battalion and the second asked if the results of the application would improve the processes. The findings from Phase One of the research indicated that a Process Action Team could successfully study the processes and problems in a truck battalion and develop recommended improvements and solutions. The findings from Phase Two confirmed that the majority of the recommendations from the PAT would indeed have improved the processes. The overall conclusion then,

is that TQM can improve a truck battalion's operations through the implementation of Process Action Teams.

## Simulation Problems

There were, however, several problems encountered during the conduct of the Process Action Team, some of which were directly attributable to the nature of the simulation. The different conditions in an actual battalion would greatly reduce the impact of these problems. The potential effectiveness of a PAT would therefore be greater in a real-life situation in a battalion.

One of the factors that would be less of a problem in an actual battalion is obtaining team members to participate in the PAT. Whereas for the research the author screened volunteers, in a battalion the commander, executive officer, or operations officer could just as easily direct the necessary people to participate. Although there is the danger the people selected might not actively support the process, team expert Thomas Berry argues it is better in initial team efforts to direct participation.[2]

Limited time was another factor in the research design that would be less problematic in a battalion. The time factor was mentioned by the PAT members in their final interview with the author. They would have preferred longer meetings (90 minutes versus 60 minutes) to be able to spend more time on each of the problems they studied. Also, the simulated PAT was limited to only nine meetings in order to

incorporate it into the CGSC students' class schedules. Both of these problems could be easily solved in a battalion, particularly where the commander or operations officer (who normally schedules training and other events) is involved in the success of the PAT. Depending on the severity of the problem(s) being studied, the battalion could schedule one or two hours per week indefinitely for the PAT to use for continuous problem-solving and process improvement.

The simulated PAT members did not use numerical data in the development of their process improvement recommendations. As a result, they did not use many of the TQM analytical tools available for problem-solving. Although this did not seem to hinder the team in their efforts during the simulation, it would probably have become more of an issue in an actual battalion situation where the team would be expected to work through the Plan-Do-Check-Act cycle[3] and test possible solutions with hard data. In a battalion, an actual PAT would have the numerical data available for analysis, and would hopefully have access to a trained facilitator (or someone knowledgeable in basic statistics) who could help the team with statistical analyses. The use of these powerful TQM tools would improve the effectiveness of an actual PAT beyond that of the simulated PAT conducted in the research.

The most serious problem encountered in the simulation was the lack of familiarity PAT members had with the processes in the case battalion. This factor was recognized as an issue early in the research design and several steps were taken to obviate its impact (Chapter Three addresses the threats to the validity of the research). However, it ultimately was a factor in the rejection of some of the team's recommendations during Phase Two of the research.

The team members themselves seemed to realize the limitations of someone from outside a battalion fully understanding the details and nuances affecting the many processes and activities in that battalion. Although too late for this research effort, during the final PAT interview team members noted that a separate case study for each of the members with detailed information about their particular roles and situations could have helped minimize this problem.

An interesting conclusion may be drawn from this issue. The TQM approach promotes the empowerment of workers in the search for continuous quality improvement. The quality experts remind us that the most qualified people to improve a process are those who work within the process. Members are selected for PATs based on their knowledge of and closeness to the processes being studied.[4] It follows, then, that a real Process Action Team with actual battalion

personnel would be much more effective at developing improvement recommendations than a team of CGSC students working from a case study.

In sum, despite the problems encountered during the research and the limitations in the design, the simulated PAT was able to function well and develop process improvement recommendations. Furthermore, the majority of those recommendations were accepted by the panel of experts from the case battalion. Future research in this area that would allow the PAT process to continue beyond the planning step and continue through the Plan-Do-Check-Act cycle would help corroborate these conclusions.

## PAT Process Problems

Whereas the factors of team membership, time constraints, and process familiarity in an actual battalion would be less likely to impede the success of a real PAT, there are two additional factors that have the opposite effect. The team facilitator noted the teamwork and group dynamics in the simulation worked exceptionally well, especially for a team that was together for only nine meetings. Whether this was the result of the CGSC's extensive use of small group instruction or the maturity and education level of the simulated PAT members, the same situation is not likely to be found in an actual battalion. Additionally, during the research team members did not have the emotional involvement with battalion issues that would

be likely in the battalion. The team leader and facilitator of a real PAT would be faced with the personalities of actual battalion members and the infighting and emotional attachment that go with them. In order for a real PAT to work, these two key members need to be trained to overcome the potential barriers to successful teamwork that are likely to affect a real PAT's efforts.

In a similar vein, during the simulation the author played the role of a supportive chain of command. The PAT members and two of the Expert Panel members (and the writings of the quality experts) underscored the importance of a chain of command that actively supports the activities and results of Process Action Team efforts. However, the same PAT members and panel members noted that the pace of events in an actual battalion might prevent the commander from becoming as involved as he would (or should) like to become. In an actual battalion, the chain of command would have to make the PAT's improvement efforts a high priority in order to make it a success.

The two most serious problems, then, with using a Process Action Team in a truck battalion seem to deal with teamwork and organizational support. Training might be the key in overcoming these problems. Training in the principles of TQM could reduce some of the organizational barriers to its use. As battalion leaders become more familiar with the benefits of TQM, they will be more likely

to implement it, and with every successful demonstration they will be even more likely to use it again. Training junior officers and non-commissioned officers in team-building, team problem-solving, and overcoming barriers to teamwork could not only increase cooperation and teamwork throughout the battalion, but the number of competent and confident leaders in the battalion.

## Endnotes

[1]U.S. Army, United States Army Posture Statement FY94: Change and Continuity (Washington: Department of the Army, 1993), 10-11, 78-79, and Leadership for Total Army Quality: Concept Plan (Washington: Department of the Army, n.d.), 1, 4-7.

[2]Thomas H. Berry, Managing the Total Quality Transformation (New York: McGraw-Hill, 1991), 4.

[3]Peter R. Scholtes, The Team Handbook (Menasha, Wis.: Banta Corporation, 1991), 5-31.

[4]Berry, 56-57.

## APPENDIX A

## TEAM MEMBERS

There were six key participants in Phase One of the research; the five Process Action Team members and the team facilitator. The roles played during Phase One of the research are listed below along with the name of the officer playing that role and very brief summary of his or her qualifications.

The role of PAT team leader was played by Major (MAJ) Brian Waters. He has had experience as a truck battalion operations officer at Fort Eustis, Virginia, a truck company commander in Mannheim, Germany, and a truck platoon leader at Fort Jackson, South Carolina. As team leader he played the part of the 181st Transportation Battalion assistant operations officer--a captain.

MAJ Keith Jones played the role of the battalion's trailer management officer. He has served in the 37th Transportation Command highway operations office in Kaiserslautern, Germany, and as a truck company commander. The role he played is that of a sergeant first class.

MAJ Mary Franklin played the truckmaster (a sergeant first class) of the 41st Transportation Company. She has

had experience as a truck company commander in Mannheim, Germany and platoon leader at Fort Eustis, Virginia.

CPT Rich Burns played the other company truckmaster in the case study, the 51st Transportation Company. He has served as company commander and platoon leader in the Main Support Battalions of the 25th Infantry Division and 82nd Airborne Division, respectively.

MAJ Cheryl Bester is a member of the staff at the Command and General Staff College (CGSC). She played the role of the battalion's highway operations non-commissioned officer (a sergeant first class filling a master sergeant position). Her experience includes not only truck platoon operations but also movement control operations.

MAJ Brian Healy is a member of the staff and faculty at CGSC. He is a leadership instructor and had some experience as a group moderator prior to playing the role of team facilitator during Phase One of the research.

The three Expert Panel members who assessed the recommendations of the PAT all have experience in the case battalion--the 181st Transportation Battalion. LTC James Stordahl was the battalion commander from October, 1991 through November, 1993. LTC Bill Key served as the battalion's operations officer and executive officer during the same time-frame; as operations officer from December, 1989 to June, 1991 and as executive officer from June, 1991 to February, 1992. Finally, CPT (P) Mike Norkus has the

most recent experience as he is the current operations officer in the battalion, serving from August, 1993 until the time of this research.

Each of the panel members were familiar with the situations and problems expressed in the case study. The author developed the case based on his experience as the battalion's operations officer between February, 1992 and May, 1993. LTC Key and CPT (P) Norkus served in the same position before and after the author, respectively. LTC Stordahl served during the same period.

## APPENDIX B

## CASE STUDY

The author developed the following case study based on his experience as the 181st Transportation Battalion operations officer. The situation and problems described in the case are accurate and actually occurred at some point during his tour in the battalion. A copy of the case was given to each of the Process Action Team members prior to beginning Phase One of the research.

### General Situation

The battalion had two medium truck companies, two POL transport companies, one light-medium company, and two HET companies. A small minority of the battalion's missions were heavy lift missions, which were given to the HET companies. Each of the other companies supported the preponderance of the battalion's mission load, which comprised theater ammunition retrograde, the corps' repair parts Rapid Delivery System, support of the division in density, community POL support, and other smaller missions.

Maintenance was a problem, but the most pressing problem was a critical shortage of trained drivers. The battalion had recently missed missions (some of them very

highly visible missions) and on several occasions had come very close to running out of trailers to support the mission load.

The battalion's mission workload had increased dramatically during Operation Desert Shield/Storm (ODS), and remained high due to USAREUR drawdown efforts, especially ammunition retrograde operations. The battalion now pulled about three times the pre-ODS workload on a continuous basis.

## Trailer Operations

The battalion commander consolidated the 40-foot trailer fleet from the two medium truck companies and attached them to the headquarters detachment (HHD). He was concerned with the low operational maintenance rate in the fleet when the two companies were responsible for their own trailers. Although the maintenance status of the fleet improved, there continued to be problems with trailer management and control.

Since the headquarters detachment was not adequately staffed for the mission, soldiers were taken from other companies and attached to HHD for trailer maintenance and control. Responsibilities for the trailers were determined through meetings between the company truckmasters and the trailer control point NCOIC from HHD. Since control of the trailer fleet was considered crucial to the battalion's success, the soldiers selected for trailer control point

duty were among the best in the battalion, and all hand-picked by the NCOIC.

Major maintenance and repair was done by mechanics from HHD, but the responsibility for minor work, such as tire repair, continued to cause confusion. Drivers refused to accept trailers with mechanical problems from the trailer yard, and the trailer yard personnel refused to accept trailers with problems from drivers off the road. Drivers began refusing to pick up trailers from customer locations to keep from having to repair them. All this exacerbated the shortage of available trailers for mission support.

A new system of dispatching was developed for trailers. The battalion highway operations section made an extra copy of each mission sheet from missions given to the truck companies. This copy was forwarded to the trailer control point two to three days prior to the date the mission would occur. The trailer control point personnel used these sheets for planning so there were the correct number of trailers in the correct configuration available for the truck drivers each morning for the missions that day.

The battalion operations officer soon began to notice that trucks were departing the motor park later in the mornings, in some cases causing late arrivals at destination and later return to origin. Company drivers and truckmasters complained that the reason was the trailers

were not ready for dispatch from the trailer control point on time in the mornings. Most of the problems were minor, such as lights and tires, but caused delays in dispatching. The trailer control point personnel in turn complained that drivers were not returning trailers from customer locations as scheduled, causing trailer shortages.

The shortage of available trailers was a continual problem, especially since the new trailer control point had difficulty controlling and tracking the battalion's trailer assets. From the beginning of the consolidation effort, trailer control point personnel had difficulty locating each of the battalion's 300-plus M872 trailers. The operations officer procured a computer for the trailer managers and directed they develop a database with each trailer's bumper number, location, maintenance status, and configuration annotated. In meetings between the battalion highway operations personnel and the trailer managers, reporting requirements for the trailer fleet were determined. Both the battalion highway operations NCO and the trailer control point NCOIC reviewed these reports, and reported to the operations officer when a trailer shortage seemed imminent.

Based on initial reports, however, the operations officer felt there were too many trailers with unknown location and status. Additionally, he felt there were too many trailers committed at customer locations for too long a time frame. Although the stated rule was that customers

would off-load trailers within three days, in reality trailers stayed out much longer. In an effort to correct these two situations, he asked for reports from the trailer control point that highlighted overdue trailers, and he asked the battalion highway operations staff to stress the return of those trailers.

## Reporting

The battalion had a system in place for reporting problems encountered by drivers while on missions. Drivers were to complete a form that called for mission identification number and an explanation of the problem, and forward the form through their chain of command to the battalion highway operations officer, who would forward it to the battalion commander.

There seemed to be some problems with the system, however. Initially, company truckmasters forwarded problem reports to battalion that indicated internal company problems, without any corrective actions being taken at the company level. After the battalion operations officer brought this to the attention of the truckmasters, fewer problem reports surfaced. Almost all the ones that did focused on battalion level and customer problems. These problems included trailer problems as noted above, which ultimately caused an increasingly antagonistic relationship between the three parties involved--the truck companies, the

headquarters detachment, and the battalion highway operations staff.

Another problem with the reporting system was timeliness. Reports invariably took several days to reach the battalion staff. By that time any corrective actions were normally "overtaken by events." As an example, drivers occasionally would complain that customers would not offload trucks until after customer lunch breaks, delaying the drivers 90 minutes on location. Normally, these problem reports reached the battalion several days later, poorly written, with no names and only sketchy information. Although efforts were made to respond to each driver problem report, apathy seemed to overcome the system, resulting in fewer and fewer reports forwarded.

## Control Over Missions

The battalion operations officer was concerned that the battalion had only minimal control over drivers while they were on missions. Many customer locations had limited telephone lines and the battalion highway operations section had only two lines, which were notoriously busy. When drivers had problems on the road that needed immediate resolution (either customer support problems or mechanical problems or accidents), they reported great difficulty in reaching help. An example is at one ammunition site where snow frequently made access unsafe. Since the most dangerous section of road was several miles from phones,

drivers were left with the decision of cancelling the mission or accepting a high risk of accidents.

Although the battalion had one mobile phone, the commander used it to maintain contact with his command while on the road. The battalion operations officer attempted to acquire a second phone for use in large-scale or critical missions, but the request was denied by higher headquarters.

The operations officer was also concerned that company NCOs were not maintaining adequate control over drivers on missions. Even if a mission called for several trucks, the companies would send drivers out individually, and they would return individually after mission completion. As a result, there was little unit cohesion, increased incidents of speeding and unsafe driving, and increased risk of occasions where drivers would be alone and in need of help. To combat this, the battalion operations staff stressed unit cohesion in passing missions to the companies, and eventually required an NCO in charge of every multi-truck mission pulled.

Although battalion NCOs did not initially support it, battalion continued to stress unit cohesion whenever possible. Trucks were required to convoy to and from mission locations as units. Members of platoon and/or company chains of command were required to accompany larger missions, and NCOICs were required on all multi-truck missions. Whenever possible, smaller missions were adjusted

so platoons and companies could take larger missions as whole units. As an example, several small missions to Holland were consolidated into a company mission and the entire company (including chain of command and maintenance section) took part in the mission.

Battalion developed a team from the highway operations section to conduct spot checks of missions on the road and at customer sites. This team checked vehicle maintenance, dispatching procedures, customer satisfaction, and compliance with established procedures. Many problems were discovered, primarily with maintenance and noncompliance with battalion SOPs. Typically, the breakdown seemed to be in the chain of command, with NCOs not supporting or enforcing rules. Increased battalion intervention was not initially supported by the NCOs in the battalion, but did seem to improve operations.

## APPENDIX C

## DETAILED FINDINGS

This appendix provides detailed findings from the research. The author's observations are taken from his notes of the simulated PAT meeting activities and include the PAT's improvement recommendations. The author's notes from the final PAT interview on 7 February consolidate team member comments on the simulation and the PAT process. The team facilitator provided the author written comments addressing the teams' group behavior, which has been paraphrased and incorporated into notes of discussions between them during and after the simulation. The Expert Panel member assessments of the PAT recommendations are taken from the author's notes of his telephonic interviews with each member.

### Author's Observations: Process Action Team

#### Meeting 1: 7 January 1994

The author explained the research methodology and PAT members' responsibilities. Members were all introduced to the team facilitator who described his role. The author distributed case studies, reviewed the case battalion situation, and gave the team general guidance indicating

that the "battalion commander" wanted the team to develop recommendations to improve the battalion's operations. Priorities were set for trailer operations first, followed by reporting problems, then by control capability over missions (the three major problem areas described in the case study).

Each team member (except the facilitator and the one member from the CGSC staff) had a different class schedule. The team had difficulty finding a mutually acceptable time for regular meetings, and Meeting 1 ended without resolution, other than a date for Meeting 2. Team members were instructed to obtain copies of The Team Handbook by Peter R. Scholtes to help guide them through PAT activities.

Meeting 2: 12 January 1994

The team spent the first part of this meeting resolving the scheduling issue. The focus of this meeting was training--both on TQM in general and on Process Action Teams in particular. Although the team facilitator was scheduled to provide the instruction, he was not available so the author explained the TQM approach and how teams conducted problem-solving (the instruction was taken from The Team Handbook).

Immediately after the training, team members began offering solutions to the case battalion's trailer control problems based on procedures used in other units. However, the team leader refocused the team on identifying the

problems. The team had nine problems listed by the end of the meeting and determined to complete the list next meeting.

Meeting 3: 14 January 1994

The team decided it should set a goal before listing possible problems to solve. They proposed the following goal: to find the best way to manage the battalion's 40-foot trailer fleet. They thought the chain of command should approve the goal before further action, so the battalion commander (role-played by the author) reviewed and approved it.

The team then revisited the issue of which problems they planned to address. They finalized the following list of seven:

1. The trailer management structure was too austere for the workload.
2. Trailer maintenance was poor.
3. Trailer accountability was poor.
4. Interface with customers was poor.
5. Drivers were not disciplined in following standard operating procedures.
6. Trailers were not accepted into the trailer park unless they were fully mission-capable.
7. Battalion lacked the capability to communicate effectively with drivers while on the road.

The team asked for additional guidance in terms of the limitations or boundaries of the PAT's charter in the battalion. Specifically, they asked if the consolidated trailer fleet could be returned to control of the individual truck companies, and they asked how involved the battalion operations officer and section could get in the trailer management function. The "battalion commander" told them he wanted to retain the consolidated trailer fleet, and that the operations officer could and should get as involved as necessary to improve the situation.

Meeting 4: 19 January 1994

This was one of the more productive meetings: the first meeting the team began describing processes. At the beginning of the meeting the team leader reviewed the team's goal and the problems it wanted to improve, but then seemed unsure of what the team's next step should be. Although he asked the author for help, the facilitator reminded him that the first step in process improvement is to describe the process--using flowcharts, pareto analyses, data collection, etc.

Based on the amount of work that would be involved in this step, the team decided to reconsider which processes it would address for improvement. They ultimately narrowed their focus to three areas: trailer accountability and control, trailer maintenance, and the flow of trailers in and out of the trailer park. With these processes in mind,

they began flowcharting how truck missions were passed in the battalion.

Meeting 4 lasted 90 minutes instead of the usual 60 minutes, and team members commented that they seemed to get more work done during this meeting because of the extra time to organize their efforts. However, the facilitator observed that in an actual PAT team members would develop flowcharts, collect data, and do most of their work between PAT meetings. The meetings would be used primarily to address problems and generate solutions or additional data collection requirements.

### Meeting 5: 24 January 1994

During this meeting the team identified specific problems with the battalion trailer flow process. The author recommended the team use a cause and effect diagram to help them identify and list all the possible causes of the problems, but the team disregarded the suggestion and continued to list the problems without the help of a diagram. By the end of the meeting they had developed the following five recommendations, which they felt would make trailer dispatching more efficient in the mornings, minimize the maintenance problems occurring during dispatching, and increase the trailer control point's control over the trailer fleet.

1. Put a fence around the trailer park, or at least a gate of some kind at the entrance/exit to help the trailer managers control access to the trailers.

2. Enforce driver preventive maintenance on trailers before dispatching by having a mechanic with tools at the trailer park exit in the mornings to check.

3. Begin tracking maintenance problems to determine frequency by type for future actions.

4. Install a system whereby the drivers are not released by their companies until the trailer managers sign off on the Form DD1970.

5. Use assigned parking for trailers, preferably one spot for each trailer. At least a separate area for unserviceable ones, for serviceable box trailers, for serviceable flatbeds, etc.

Meeting 6: 26 January 1994

During Meeting 6 the team began to study two processes: the use of Trailer Interchange Receipts (TIRs) and customer interface. Team members again used flowcharts to describe the processes and identify problem areas for consideration. The team developed the following recommendations.

1. Begin to rigidly enforce the use of TIRs, and have customers sign them when receiving a trailer.

2. Provide customers a copy of the TIR after they sign for the trailer.

3. Manage trailers by bumper number instead of allowing any one to be used for a particular mission. The trailer managers should designate which trailer on the mission sheet and the TIR, and should enforce only dispatching the correct trailer for each mission in the mornings. Customers should be required to use the correct trailers for each mission, too.

4. Any deviation or change of trailers should not be allowed without prior approval by the trailer managers.

5. Battalion should obtain another phone for the trailer managers to meet the expected increase in phone traffic, both from drivers asking for authority to move different trailers, and outgoing calls to customer sites coordinating which trailer will be used for future missions.

The team began studying customer interface during this meeting but did not finish. They decided to start with it during Meeting 7.

Meeting 7: 31 January 1994

The team began this meeting with a review of the flowchart they had begun the previous meeting looking at customer interface. They completed the chart and developed the following recommendations.

1. In addition to enforcing driver usage of TIRs, enforce customer usage of TIRs and have the customer sign the TIR prior to releasing the trailer to him.

2. Increase contact with the customer by having the NCO in charge of the mission coordinate with a single customer point of contact on all missions.

3. Require the NCO in charge of each mission to survey the trailer status at customer locations and report the results to the trailer managers and battalion.

4. Continue to have a battalion representative visit customer locations frequently to discuss problems and locate trailers.

5. Assign truck companies responsibility for customer interface with selected customers. Develop a special relationship between company personnel and the customer.

The team finished the customer interface recommendations early in the meeting and moved on to study how the battalion trailer managers confirmed trailer status on regular basis. They discovered there was no formal, daily trailer survey so they recommended the following actions.

1. Trailer managers should establish two shifts and conduct a 100% survey of the trailer park each night to determine the number of trailers by category and type.

2. The results of the nightly survey should be forwarded to the battalion highway operations section either the same day or the next morning.

3. Battalion should use the information from that report to confirm the availability of the correct quantity, by

type, of trailers for upcoming missions, and for availability forecasting.

Meeting 8: 2 February 1994

This was the final meeting for the team to develop improvement recommendations. They explored the battalion's mission close out process and determined two improvements were necessary.

1. Truck companies should forward completed mission sheets to battalion.

2. Battalion highway operations personnel should use these sheets to close out the battalion mission log and file the sheets.

Meeting 9: 7 February 1994

During this final meeting the team reviewed their process improvement recommendations. The author conducted a final interview with PAT members to obtain their comments on the simulation and the PAT process. Finally, each member was thanked for participating and released.

## Final PAT Interview Results

The final interview with PAT members was conducted during Meeting 9. The author prompted team member comments by asking questions in five different areas: the meetings, role-playing, the case study, the PAT process, and using the process in an actual battalion. A summary of their responses are as follows.

The team decided 60 minutes was not long enough for the meetings, particularly when the first 5-10 minutes were taken up getting started. They felt the ideal length would be 90 minutes. They recognized the problem they had initially in setting a workable schedule, but were able to work through that problem. Administrative support for the meetings was problem-free, since CGSC classrooms were available. They felt they could have been more organized if they had set an agenda for each meeting and then evaluated how well each meeting went at the end of the meeting.

They observed that role-playing was ineffective during the PAT simulation. They did not have enough information about each of the roles to play the part, and ultimately disregarded the role-playing aspect of the simulation. Although they felt the roles assigned to the PAT were appropriate, they would also have included customers and maintenance personnel, if possible. They noted that in an actual battalion it would help for the team leader to be the battalion assistant highway operations officer: as a captain he could more easily resolve any conflict or issues during the meetings.

They felt the case study served its purpose well, especially after the author reviewed it during the first meeting, but recommended a separate case study for each of the roles to be played for future simulations. A separate case study could be designed to provide different points of

view for each of the battalion roles to be played in the simulation.

Team members did not feel comfortable initially with their understanding of how the PAT process was supposed to work. However, as the meetings progressed and the facilitator coached them they became more confident. They noted that he stepped in twice during the simulation to help the team refocus its efforts. Although the facilitator felt they needed more training in the use of TQM tools, the team saw no need since they had no numerical data to analyze.

The team members felt a PAT would only work in a truck battalion if the commander supported it, and recommended that he or the operations officer be actively involved in the PAT. They observed that possible hurdles to a successful PAT in a battalion include rapid personnel turnover, lack of motivation on the part of team participants, and a rapidly changing environment. They noted that TQM required a stable environment to be effective, and would be most easily implemented if it was started on a small scale and gradually grew to address larger battalion issues. However, they generally agreed they would try to employ Process Action Teams in their next assignment if possible.

## Facilitator Comments

In addition to acting as the group facilitator for the simulated PAT, MAJ Healy observed the group's behavior

patterns and provided the author his comments after the last team meeting. He noted the most common behaviors in the meetings dealt with sharing and clarifying information, while there was very little group sensitivity behavior exhibited. He pointed out this pattern of behavior was indicative of highly task-oriented teams, and he characterized the team in that manner.

He noted that the team worked very well together in spite of the limited amount of team-building activities conducted. He attributed this to the prevalence of small group instruction at the Command and General Staff College. He commented on the lack of numerical data for statistical analyses during the simulation, and attributed the team's ambivalence toward the use of TQM tools to their lack of training in that area.

The facilitator also commented on the failure of the role-playing aspect of the simulation. Although he noted early in the process that team members were not playing the roles to which they were assigned, he felt it was not crucial to observing the PAT process and did not invalidate the simulation.

## Expert Panel Assessments

The author conducted telephonic interviews with three officers with experience in the 181st Transportation Battalion--the battalion depicted in the case study. The interviews began with a general explanation of the research

project and their roles in it. Then the author described each of the specific recommendations from the PAT, and asked for comments. This was done consecutively for each of the five battalion processes studied by the PAT. Panel members were asked to consider three broad aspects of each recommendation in his assessment: would it have worked in the battalion, would it have improved the process as intended, and would they have approved it when they were in the battalion.

The first battalion process assessed by each panel member was the trailer flow process. All three of the panel members concurred with the PAT's recommendations, observing that each the five suggested changes would have worked, would have improved trailer issue, and that they would have approved them. Members expressed concern about lack of space to assign each trailer a parking spot, but agreed with setting aside areas for trailers by type or status. None of the members saw a need for completely fencing off the trailers from the rest of the motor park, but agreed with the idea of controlling access at an entry/exit gate. CPT Norkus was very enthusiastic about the recommendation of having the trailer managers release the truck drivers on Form DD1970 at the end of missions.

The panel members next assessed the recommendations made on the usage of Trailer Interchange Receipts (TIR). Each of them agreed with the recommendations made on this

process. LTC Key thought the increased use of TIRs and managing trailers by bumper number would have a tremendous positive impact on the battalion's trailer operations. He did express concern about how cooperative the customers would be in this endeavor. CPT Norkus stressed the importance of providing additional telephones for the trailer managers.

Four of the five customer interface recommendations were accepted by each of the panel members without problem. In fact, CPT Norkus observed that he had been using a senior non-commissioned officer to do just what recommendation number four suggested--act as a battalion customer representative and conduct frequent site visits looking for problems. The fifth recommendation (requiring the truck companies to develop special customer relationships), however, was the first to be rejected by the panel. Each of the members noted the recommendation was not feasible in the battalion because the mission workload was not stable enough to support a special relationship between a customer and one of the truck companies. Additionally, LTC Stordahl observed that even if this recommendation would have worked in the battalion, he would not have approved it because it would decentralize the process of customer interface below the battalion level. LTC Key had similar comments, noting he was not convinced the recommendation would improve operations even if approved.

The fourth process studied by the PAT was the nightly trailer yard check. The recommendations put forth for this process met with the approval of all the panel members. LTC Key noted it was an important process and even if the recommendations required the diversion of additional personnel to man the shifts and conduct the checks, the benefits realized in improved trailer accountability would be worth it.

The final process was mission close out. The two recommendations made for this process were considered irrelevant by LTC Stordahl and LTC Key. While they saw no reason the recommendations could not work in the battalion, they felt the changes would have no effect on improved battalion operations. Although they both remarked that they would not have disapproved the recommendations simply because they did not see the benefits, the recommendations were rejected by the Expert Panel based on the decision criteria in the research design. (LTC Key commented that approvel of such a recommendation, even though not completely effective, would probably be beneficial to the well-being of the PAT. He noted the display of chain of command support for the PAT's efforts might be more important than developing an effective recommendation.)

An interesting note is that this process was the only one with a split decision by the panel. CPT Norkus was the only panel member who felt the recommendations met the

three panel criteria. Based on the current situation in the U.S. Army in Germany (USAREUR), he felt the information collected in the mission close out process would be beneficial in analyzing the impact of installation drawdowns among the battalion's subordinate organizations.

Table 1.--Summary of Process Action Team Recommendations and Expert Panel Member Assessment Results

| Battalion Process Studied by PAT | Number of PAT Recommendations | Panel Concurrence Rate | | |
|---|---|---|---|---|
| | | Expert A | Expert B | Expert C |
| Trailer Flow | 5 | 5/5 | 5/5 | 5/5 |
| TIR Usage | 5 | 5/5 | 5/5 | 5/5 |
| Customer Interface | 5 | 4/5 | 4/5 | 4/5 |
| Nightly Yard Check | 3 | 3/3 | 3/3 | 3/3 |
| TMR Close Out | 2 | 0/2 | 0/2 | 2/2 |

Table 1 summarizes the Expert Panel assessments made during Phase Two of the research. The members accepted all the recommendations for three of the processes (trailer flow, TIR usage, and nightly yard checks). One of the five customer interface recommendations was rejected by all members, but the majority were accepted. The TMR close out process, however, experienced a split decision between the panel members. Since two of them rejected a majority of the recommendations, the entire improvement plan for that process was rejected.

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